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NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

HEARING

BEFORE THE

SUBCOMMITTEE ON
ENERGY REGULATION AND CONSERVATION

OF THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

NINETY-NINTH CONGRESS

SECOND SESSION

ON

S. 2781

A BILL TO AMEND THE ENERGY POLICY AND CONSERVATION ACT WITH RESPECT TO ENERGY CONSERVATION STANDARDS FOR APPLIANCES

SEPTEMBER 16, 1986

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NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

TUESDAY, SEPTEMBER 16, 1986

U.S. Senate,
Subcommittee on Energy
Regulation and Conservation,
Committee on Energy and Natural Resources,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:30 a.m., in room SD-366, Dirksen Senate Office Building, Hon. Daniel J. Evans presiding.

Present: Senators Evans, Nickles, Hecht, and Ford.

Also present: Allen Stayman, professional staff member; Benjamin S. Cooper, professional staff member for the minority; and James T. Bruce, counsel for the minority.

OPENING STATEMENT OF HON. DANIEL J. EVANS, A U.S. SENATOR FROM THE STATE OF WASHINGTON

Senator **Evans**. This hearing of the Subcommittee on Energy Regulation and Conservation of the Committee on Energy and Natural Resources will come to order.

I am pleased to join you today to conduct a hearing on S. 2781, the National Appliance Energy Conservation Act of 1986, a bill I introduced on August 15, 1986, along with several of my colleagues, including seven members of our Energy Committee.

I take particular pleasure in the spirit of cooperation which has marked the development of this important piece of legislation. It is rare indeed that Congress sees representatives from industry and environmental organizations joining together in support of any legislative proposal. With this kind of bill, establishing a consensus is clearly necessary if we are to act before the end of this legislative session.

The origins of this bill extend clear back to 1975, when Congress passed the Energy Policy and Conservation Act which directed the Department of Energy to consider the issue of appliance efficiency standards. In 1978, as I think most in this audience know, Congress took an additional step and approved legislation which required DOE to promulgate regulations establishing minimum standards.

After much delay, DOE promulgated the zero-level standard in 1983. This so-called no standard standard expressed their view that the economic benefits of setting actual efficiency standards did not justify interference by the Federal Government in the marketplace.

The National Resources Defense Council, now a member of the coalition supporting S. 2781, brought suit against the DOE, and in July 1985 the District of Columbia Court of Appeals ruled in favor of the NRDC and directed the Department to issue substantive standards.

In the meantime, several States were moving to establish their own set of standards, with California actually adopting such legislation. Prior to coming to the Senate, as chairman of the Northwest Power Planning Council, I joined with other members of the council to suggest considering adopting standards for the four Northwest States, but we did not act in our first energy plan. I should also note that in this year's power plan, recently released by the council, there is a provision calling for the approval of a California-type standard for the region.

The stage was therefore set for the development of the compromise which is now before us. The manufacturers of refrigerators, furnaces, air-conditioners, and other home appliances were aware of the severe economic difficulties which could result from the fragmentation of the marketplace as each State adopted its own set of efficiency standards.

The NRDC and other environmental and conservation groups had long understood the benefits to both the consumer and the environment which would result from substantive standards; therefore, rather than to continue to oppose each other in courts, the two sides chose to sit down and negotiate a solution.

It is a compromise. I think perhaps compromise may be the wrong term. I think it is a solution that will not only provide immediate relief to the industry, it has real benefits for consumers who stand to save approximately $25 billion by the year 2000. It will also provide an important tool for utilities and State regulatory agencies as they anticipate their future energy needs.

As chairman of the Alliance to Save Energy, I am keenly aware that in today's energy market, conservation represents a truly cost-effective energy resource and reduces the need for expensive new generating plants and the negative impact on the environment which accompany them, and does not include the controversy which seems to surround almost any new central plant. I am pleased to note that the alliance has been active in the coalition supporting this bill.

Despite the relatively limited time before sine die adjournment—at least we hope it is a relatively limited time before sine adjournment—I am hopeful that the full Senate can take action on this legislation. I have been in close contact with the prime sponsor in the House, Congressman Ed Markey, and I know he shares my commitment in attempting to achieve final passage yet this year. In fact, I understand that even as we begin this hearing, the House Energy and Commerce Committee begins markup of H.R. 5465, the companion to S. 2781.

I am also aware that there are a few issues still to be resolved as we move forward on the bill, and I am hopeful that today's testimony may help further clarify some of these points and assist us in working toward final passage.

I look forward to having the benefit of the testimony of each of the witnesses, and I think now is the time to hear from them.

Before I introduce the first panel, I would ask that a statement of Senator Johnston of Louisiana and Senator Cranston of California be introduced into the record at this point.

[The text of S. 2781 and statements of Senators Johnston and Cranston follow:]

99TH CONGRESS
2D SESSION

S. 2781

To amend the Energy Policy and Conservation Act with respect to energy conservation standards for appliances.

IN THE SENATE OF THE UNITED STATES

AUGUST 15 (legislative day, AUGUST 11), 1986

Mr. EVANS (for himself, Mr. JOHNSTON, Mr. CRANSTON, Mr. MATSUNAGA, Mr. WEICKER, Mr. FORD, Mr. MELCHER, Mr. BUMPERS, Mr. SARBANES, and Mr. GRASSLEY) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

---

A BILL

To amend the Energy Policy and Conservation Act with respect to energy conservation standards for appliances.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "National Appliance Energy Conservation Act of 1986".

SEC. 2. DEFINITIONS.

(a) ENERGY CONSERVATION STANDARD.—Section 321(a)(6) of the Energy Policy and Conservation Act (42 U.S.C. 6291(a)(6)) is amended to read as follows:

"(6) The term 'energy conservation standard' means—

"(A) a performance standard which prescribes a minimum level of energy efficiency or a maximum quantity of energy use for a covered product, determined in accordance with test procedures prescribed under section 323; or

"(B) a design requirement for the products specified in paragraphs (6), (7), (8), (10), and (12) of section 322(a); and

includes any other requirements which the Secretary may prescribe under section 325(m)."

(b) NEW DEFINITIONS.—Section 321(a) of the Energy Policy and Conservation Act (42 U.S.C. 6291(a)) is amended by adding at the end the following paragraphs:

"(19) The term 'AV' is the adjusted volume for refrigerators, refrigerator-freezers, and freezers, as defined in the applicable test procedure prescribed under section 323.

"(20) The term 'annual fuel utilization efficiency' means the efficiency descriptor for furnaces and boilers, determined using test procedures prescribed under section 323 and based on the assumption that all—

"(A) weatherized warm air furnaces or boilers are located out-of-doors;

"(B) warm air furnaces which are not weatherized are located indoors and all combustion and ventilation air is admitted through grills and ducts from the outdoors; and

"(C) boilers which are not weatherized are located within the heated space.

"(21) The term 'central air conditioner' means a product, other than a packaged terminal air conditioner, which—

"(A) is powered by single phase electric current;

"(B) is air-cooled;

"(C) is rated below 65,000 Btu per hour;

"(D) is not contained within the same cabinet as a furnace the rated capacity of which is above 225,000 Btu per hour; and

"(E) is a heat pump or a cooling only unit.

"(22) The term 'efficiency descriptor' means the ratio of the useful output to the total energy input, determined using the test procedures prescribed under section 323 and expressed for the following products in the following terms:

"(A) For furnaces and direct heating equipment, annual fuel utilization efficiency.

"(B) For room air conditioners, energy efficiency ratio.

"(C) For central air conditioning and central air conditioning heat pumps, seasonal energy efficiency ratio.

"(D) For water heaters, energy factor.

"(E) For pool heaters, thermal efficiency.

"(23) The term 'energy efficiency ratio' means a ratio (expressed in Btu per hour/per watt) calculated by dividing the cooling capacity in Btu per hour by the power input in watts at any given set of rating conditions, determined using the test procedures prescribed under section 323.

"(24) The term 'furnace' means a product which utilizes only single-phase electric current, or single-phase electric current or millivoltage DC current in conjunction with natural gas, propane, or home heating oil, and which—

"(A) is designed to be the principal heating source for the living space of a residence;

"(B) is not contained within the same cabinet with a central air conditioner whose rated cooling capacity is above 65,000 Btu per hour;

"(C) is an electric central furnace, electric boiler, forced-air central furnace, gravity central furnace, or low pressure steam or hot water boiler; and

"(D) has a heat input rate of less than 300,000 Btu per hour for electric boilers and low pressure steam or hot water boilers and less than 225,000 Btu per hour for forced-air central furnaces, gravity central furnaces, and electric central furnaces.

"(25) The terms 'heat pump' or 'reverse cycle' mean a product, other than a packaged terminal heat pump, which—

"(A) consists of one or more assemblies;

"(B) is powered by single phase electric current;

"(C) is rated below 65,000 Btu per hour;

"(D) utilizes an indoor conditioning coil, compressors, and refrigerant-to-outdoor-air heat exchanger to provide air heating; and

"(E) may also provide air cooling, dehumidifying, humidifying circulating, and air cleaning.

"(26) The term 'pool heater' means an appliance designed for heating nonpotable water contained at atmospheric pressure, including heating water in swimming pools, spas, hot tubs and similar applications.

"(27) The term 'thermal efficiency of pool heaters' means a measure of the heat in the water delivered at the heater outlet divided by the heat input of the pool heater as measured under test conditions specified in section 2.8.1 of the American National Standard for Gas Fired Pool Heaters, Z21.56–1986, or as may be prescribed by the Secretary.

"(28) The term 'water heater' means a product which utilizes oil, gas, or electricity to heat potable water for use outside the heater upon demand, including—

"(A) storage type units which heat and store water at a thermostatically controlled temperature, including gas storage water heaters with an input of 75,000 Btu per hour or less, oil storage water heaters with an input of 105,000 Btu per hour or less, and electric storage water heaters with an input of 12 kilowatts or less;

"(B) instantaneous type units which heat water but contain no more than one gallon of water per 4,000 Btu per hour of input, including gas instantaneous water heaters with an input of 200,000 Btu per hour or less, oil instantaneous water heaters with an input of 210,000 Btu per hour or less, and electric instantaneous water heaters with an input of 12 kilowatts or less; and

"(C) heat pump type units, with a maximum current rating of 24 amperes at a voltage no greater than 250 volts, which are products designed to transfer thermal energy from one temperature level to a higher temperature level for the purpose of heating water, including all ancillary equipment such as fans, storage tanks, pumps, or controls necessary for the device to perform its function.

"(29) The term 'weatherized warm air furnace or boiler' means a furnace or boiler designed for installation outdoors, approved for resistance to wind, rain, and snow, and supplied with its own venting system."

SEC. 3. COVERAGE.

Section 322(a) of the Energy Policy and Conservation Act (42 U.S.C. 6292(a)) is amended to read as follows:

"SEC. 322. (a) IN GENERAL.—The following consumer products, excluding those consumer products designed solely for use in recreational vehicles and other mobile equipment, are covered products:

"(1) Refrigerators, refrigerator-freezers, and freezers which can be operated by alternating current electricity, excluding—

"(A) any type designed to be used without doors; and

"(B) any type which does not include a compressor and condenser unit as an integral part of the cabinet assembly.

"(2) Room air conditioners.

"(3) Central air conditioners and central air conditioning heat pumps.

"(4) Water heaters.

"(5) Furnaces.

"(6) Dishwashers.

"(7) Clothes washers.

"(8) Clothes dryers.

"(9) Direct heating equipment.

"(10) Kitchen ranges and ovens.

"(11) Pool heaters.

"(12) Any other type of consumer product which the Secretary classifies as a covered product under subsection (b)."

SEC. 4. TEST PROCEDURES.

Section 323 of the Energy Policy and Conservation Act (42 U.S.C. 6293) is amended to read as follows:

"TEST PROCEDURES

"SEC. 323. (a) GENERAL RULE.—All test procedures and related determinations prescribed or made by the Secretary with respect to any covered product (or class thereof) which are in effect on the date of enactment of the National Appliance Energy Conservation Act of 1986 shall remain in effect until the Secretary amends such test procedures and related determinations under subsection (b).

"(b) AMENDED AND NEW PROCEDURES.—(1)(A) The Secretary may amend test procedures with respect to any covered product if the Secretary determines that amended test procedures would more accurately or fully comply with the requirements of paragraph (3).

"(B) The Secretary may, in accordance with the requirements of this subsection, prescribe test procedures for any consumer product classified as a covered product under section 322(b).

"(C) The Secretary shall direct the National Bureau of Standards to assist in developing new or amended test procedures.

"(2) If the Secretary determines, on his own behalf or in response to a petition by any interested person, that a test procedure should be prescribed or amended, the Secretary shall promptly publish in the Federal Register proposed test procedures and afford interested persons an opportunity to present oral and written data, views, and arguments with respect to such procedures. The comment period shall not be less than 60 days and may be extended for good cause shown to not more than 270 days. In prescribing or amending a test procedure, the Secretary shall take into account such information as the Secretary determines relevant to such procedure, including technological developments relating to energy use or energy efficiency of the type (or class) of covered products involved.

"(3) Any test procedures prescribed or amended under this section shall be reasonably designed to produce test results which measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use, as determined by the Secretary, and shall not be unduly burdensome to conduct.

"(4) If the test procedure is a procedure for determining estimated annual operating costs, such procedure shall provide that such costs shall be calculated from measurements of energy use in a representative average use cycle or period of use, as determined by the Secretary, and from representative average unit costs of the energy needed to operate such product during such cycle. The Secretary shall provide information to manufacturers with respect to representative average unit costs of energy.

"(c) RESTRICTION ON CERTAIN REPRESENTATIONS.—(1) No manufacturer, distributor, retailer, or private labeler may make any representation—

"(A) in writing (including a representation on a label); or

"(B) in any broadcast advertisement,

with respect to the energy use or efficiency of a covered product to which a test procedure is applicable under subsection (a) or the cost of energy consumed by such product, unless such product has been tested in accordance with such test procedure and such representation fairly discloses the results of such testing.

"(2) Effective 180 days after an amended or new test procedure applicable to a covered product is prescribed under subsection (b), no manufacturer, distributor, retailer, or private labeler may make any representation—

"(A) in writing (including a representation on a label); or

"(B) in any broadcast advertisement,

with respect to energy use or efficiency of such product or cost of energy consumed by such product, unless such product has been tested in accordance with such amended or new test procedures and such representation fairly discloses the results of such testing.

"(3) On the petition of any manufacturer, distributor, retailer, or private labeler, filed not later than the 60th day before the expiration of the period involved, the 180-day period referred to in paragraph (2) may be extended by the

Secretary with respect to the petitioner (but in no event for more than an additional 180 days) if the Secretary determines that the requirements of paragraph (2) would impose an undue hardship on such petitioner.

"(d) CASE IN WHICH TEST PROCEDURE IS NOT REQUIRED.—(1) The Secretary is not required to publish and prescribe test procedures for a covered product (or class thereof) if the Secretary determines, by rule, that test procedures cannot be developed which meet the requirements of subsection (b)(3) and publishes such determination in the Federal Register, together with the reasons therefor.

"(2) For purposes of section 327, a determination under paragraph (1) with respect to any covered product or class shall have the same effect as would a standard prescribed for a covered product (or class).

"(c) AMENDMENT OF STANDARD.—(1) In the case of any amended test procedure which is prescribed pursuant to this section, the Secretary shall determine, in the rulemaking carried out with respect to prescribing such procedure, to what extent, if any, the proposed test procedure would alter the measured energy efficiency or measured energy use of any covered product as determined under the existing test procedure.

"(2) If the Secretary determines that the amended test procedure will alter the measured efficiency or measured use, the Secretary shall amend the applicable energy conservation standard during the rulemaking carried out with respect to such test procedure. In determining the amended energy conservation standard, the Secretary shall measure, pursuant to the amended test procedure, the energy efficiency or energy use of a representative sample of covered products that minimally comply with the existing standard. The average of such energy efficiency or energy use levels determined under the amended test procedure shall constitute the amended energy conservation standard for the applicable covered products.

"(3) Models of covered products in use before the date on which the amended energy conservation standard becomes effective (or revisions of such models that come into use after such date and have the same energy efficiency or energy use characteristics) that comply with the energy conservation standard applicable to such covered products on the day before such date shall be deemed to comply with the amended energy conservation standard.

"(4) The Secretary's authority to amend energy conservation standards under this subsection shall not affect the Secretary's obligation to issue final rules as described in section 325."

SEC. 5. ENERGY CONSERVATION STANDARDS.

Section 325 of the Energy Policy and Conservation Act (42 U.S.C. 6295) is amended to read as follows:

"ENERGY CONSERVATION STANDARDS

"SEC. 325. (a) PURPOSES.—The purposes of this section are to—

"(1) provide Federal energy conservation standards applicable to covered products; and

"(2) authorize the Secretary to prescribe amended or new energy conservation standards for each type (or class) of covered product.

"(b) STANDARDS FOR REFRIGERATORS, REFRIGERATOR-FREEZERS, AND FREEZERS.—(1) The following is the maximum energy use allowed in kilowatt hours per year for the following products (other than those described in paragraph (2)) manufactured on or after January 1, 1990:

	Energy Standards Equations
"Refrigerators and Refrigerator-Freezers with manual defrost	16.3 AV×316
Refrigerator-Freezers—partial automatic defrost	21.8 AV×429
Refrigerator-Freezers—automatic defrost with:	
Top mounted freezer without ice	23.5 AV×471
Side mounted freezer without ice	27.7 AV×488
Bottom mounted freezer without ice	27.7 AV×488
Top mounted freezer with through the door ice service	26.4 AV×535
Side mounted freezer with through the door ice	30.9 AV×547
Upright Freezers with:	
Manual defrost	10.9 AV×422
Automatic defrost	16.0 AV×623
Chest Freezers and all other freezers	14.8 AV×223

"(2) The standards described in paragraph (1) do not apply to refrigerators and refrigerator-freezers with total refrigerated volume exceeding 39 cubic feet or freezers with total refrigerated volume exceeding 30 cubic feet.

"(3)(A)(i) The Secretary shall publish a proposed rule, no later than July 1, 1988, to determine if the standards established by paragraph (1) should be amended. The Secretary shall publish a final rule no later than July 1, 1989, which shall contain such amendment, if any, and provide that the amendment shall apply to products manufactured on or after January 1, 1993. If such a final rule is not published by January 1, 1990, any amendment of such standards shall apply to products manufactured on or after January 1, 1995. Nothing in this subsection provides any justification or defense for a failure by the Secretary to comply with the nondiscretionary duty to publish final rules by the dates stated in this paragraph.

"(ii)(I) If the Secretary does not publish a final rule by January 1, 1990, relating to the revision of the energy conservation standards for refrigerators, refrigerator-freezers and freezers, the regulations which established standards for such products and were promulgated by the California Energy Commission on December 14, 1984, to be effective January 1, 1992 (or any amendments to such standards that are not more stringent than the standards in the original regulations) shall apply in California to such products, effective beginning January 1, 1993, and at all times thereafter.

"(II) If the Secretary does not publish a final rule by January 1, 1992, relating to the revision of the energy conservation standards for refrigerators, refrigerator-freezers and freezers, State regulations which apply to such products manufactured on or after January 1, 1995, shall apply to such products until the effective date of a rule issued under this section with respect to such products.

"(B) After the publication of a final rule under subparagraph (A), the Secretary shall publish a final rule no later than every five years after the date of publication of the previous final rule. The Secretary shall determine in such rule whether to amend the standards in effect for the products described in paragraph (1).

"(C) Any amendment prescribed under subparagraph (B) shall apply to products manufactured beginning five years after—

"(i) the effective date of the previous amendment; or

"(ii) if the previous final rule did not amend the standards, the earliest date by which the previous amendment could have been effective;

except that in no case may any amended standard apply to products manufactured within three years after publication of the final rule establishing such amended standard.

"(c) STANDARDS FOR ROOM AIR CONDITIONERS.—(1) The energy efficiency ratio of room air conditioners shall be not less than the following for products manufactured on or after January 1, 1990:

"Product Class	Ratio
Without Reverse Cycle and With Louvered Sides	
Less than 6,000 Btu	8.0

6,000 to 7,999 Btu	8.5
8,000 to 13,999 Btu	9.0
14,000 to 19,999 Btu	8.8
20,000 and more Btu	8.2
Without Reverse Cycle and Without Louvered Sides	
Less than 6,000 Btu	8.0
6,000 to 7,999 Btu	8.5
8,000 to 13,999 Btu	8.5
14,000 to 19,999 Btu	8.5
20,000 and more Btu	8.2
With Reverse Cycle and With Louvered Sides	8.5
With Reverse Cycle, Without Louvered Sides	8.0

"(2)(A) The Secretary shall publish a final rule no later than January 1, 1992, to determine if the standards established under paragraph (1) should be amended. Such rule shall contain such amendment, if any, and provide that the amendment shall apply to products manufactured on or after January 1, 1995.

"(B) After January 1, 1992, the Secretary shall publish a final rule no later than every five years after the date of publication of a previous final rule. The Secretary shall determine in such rule whether to amend the standards in effect for such products.

"(C) Any amendment prescribed under subparagraph (B) shall apply to products manufactured beginning five years after—

"(i) the effective date of the previous amendment; or

"(ii) if the previous final rule did not amend the standards, the earliest date by which a previous amendment could have been effective;

except that in no case may any amended standard apply to products manufactured within three years after publication of the final rule establishing such amended standard.

"(d) STANDARDS FOR CENTRAL AIR CONDITIONERS AND HEAT PUMPS.—(1) The seasonal energy efficiency ratio of central air conditioners and central air conditioning heat pumps shall be not less than the following:

"(A) Split Systems: 10.0 for products manufactured on or after January 1, 1992.

"(B) Single Package Systems: 9.7 for products manufactured on or after January 1, 1993.

"(2)(A) The Secretary shall publish a final rule no later than January 1, 1994, to determine whether the standards established under paragraph (1) should be amended. Such rule shall contain such amendment, if any, and provide that the amendment shall apply to products manufactured on or after January 1, 1999.

"(B) The Secretary shall publish a final rule after January 1, 1994, and no later than January 1, 2001, to determine whether the standards in effect for central air conditioners and central air conditioning heat pumps should be amended. Such rule shall provide that any amendment shall apply to products manufactured on or after January 1, 2006.

"(C) After January 1, 2001, the Secretary shall publish a final rule—

"(i) no earlier than five years and no later than seven years after the date of publication of the previous final rule; or

"(ii) if the previous final rule did not amend the standards, five years after the date of publication of the previous final rule.

The Secretary shall determine in such rule whether to amend the standards in effect for such products.

"(D) Standards amended pursuant to subparagraph (C) shall apply only to products manufactured beginning—

"(i) no earlier than five and no later than seven years after the effective date of the previous amendment; or

"(ii) if the previous final rule did not amend the standard, five years after the earliest date by which a previous amendment could have become effective;

except that in no case may any amended standard apply to products manufactured within five years after publication of the final rule prescribing such standard.

"(e) STANDARDS FOR WATER HEATERS; POOL HEATERS; DIRECT HEATING EQUIPMENT.—(1) The energy factor of water heaters shall be not less than the following for products manufactured on or after January 1, 1990:

"(A) Gas Water Heater:	.62 – (.0019 x Rated Storage Volume)
"(B) Oil Water Heater:	.59 – (.0019 x Rated Storage Volume)
"(C) Electric Water Heater:	.95 – (.00132 x Rated Storage Volume)

"(2) The thermal efficiency of pool heaters manufactured on or after January 1, 1990, shall not be less than 78 percent.

"(3) The efficiencies of gas direct heating equipment manufactured on or after January 1, 1990, shall be not less than the following:

"Wall	
Fan type	
Up to 42,000 Btu/hour	73% AFUE
Over 42,000 Btu/hour	74% AFUE
Gravity type	
Up to 10,000 Btu/hour	59% AFUE
Over 10,000 Btu/hour up to 12,000 Btu/hour	60% AFUE
Over 12,000 Btu/hour up to 15,000 Btu/hour	61% AFUE
Over 15,000 Btu/hour up to 19,000 Btu/hour	62% AFUE
Over 19,000 Btu/hour up to 27,000 Btu/hour	63% AFUE
Over 27,000 Btu/hour up to 46,000 Btu/hour	64% AFUE
Over 46,000 Btu/hour	65% AFUE
"Floor	
Up to 37,000 Btu/hour	56% AFUE
Over 37,000 Btu/hour	57% AFUE
"Room	
Up to 18,000 Btu/hour	57% AFUE
Over 18,000 Btu/hour up to 20,000 Btu/hour	58% AFUE
Over 20,000 Btu/hour up to 27,000 Btu/hour	63% AFUE
Over 27,000 Btu/hour up to 46,000 Btu/hour	64% AFUE
Over 46,000 Btu/hour	65% AFUE

"(4)(A) The Secretary shall publish final rules no later than January 1, 1992, to determine whether the standards established by paragraphs (1), (2), or (3) for water heaters, pool heaters, and direct heating equipment should be amended. Such rule shall provide that any amendment shall apply to products manufactured on or after January 1, 1995.

"(B) The Secretary shall publish a final rule no later than January 1, 2000, to determine whether standards in effect for such products should be amended. Such rule shall provide that any such amendment shall apply to products manufactured on or after January 1, 2005.

"(C) After January 1, 2000, the Secretary shall publish a final rule—

"(i) no earlier than every five years and no later than every ten years after the date of publication of the previous final rule; or

"(ii) if the previous final rule did not amend the standards, five years after the date of publication of the previous final rule.

The Secretary shall determine in such rule whether to amend the standards in effect for such products.

"(D) Such amended standards shall only apply to products manufactured beginning—

"(i) no earlier than between five years and no later than ten years after the effective date of the previous amendment; or

"(ii) if the previous final rule did not amend the standard, five years after the earliest date by which the previous amendment could have become effective;

except that in no case may any amended standard apply to products manufactured within five years after publication of the final rule establishing such standard.

"(f) Standards for Furnaces.—(1) Furnaces (other than furnaces designed solely for installation in mobile homes) manufactured on or after January 1, 1992, shall have an annual fuel utilization efficiency of not less than 78 percent, except that gas steam boilers shall have an annual fuel utilization efficiency of not less than 68 percent.

"(2) Furnaces which are designed solely for installation in mobile homes and which are manufactured on or after January 1, 1990, shall have an annual fuel utilization efficiency of not less than 75 percent.

"(3)(A) The Secretary shall publish a final rule no later than January 1, 1992, to determine whether the standards established by paragraph (2) for mobile home furnaces should be amended. Such rule shall provide that any amendment shall apply to products manufactured on or after January 1, 1995.

"(B) The Secretary shall publish a final rule no later than January 1, 1997, to determine whether the standards established by this subsection for furnaces (including mobile home furnaces) should be amended. Such rule shall provide that any amendment shall apply to products manufactured on or after January 1, 2002.

"(C) After January 1, 1997, and before January 1, 2007, the Secretary shall publish a final rule to determine whether standards in effect for such products should be amended. Such rule shall contain such amendment, if any, and provide that any amendment shall apply to products manufactured on or after January 1, 2012.

"(D) After the publication of the final rule described in subparagraph (C), the Secretary shall publish a final rule—

"(i) no earlier than five years and no later than ten years after the date of publication of the previous final rule; or

"(ii) if the previous final rule did not amend the standards, five years after the date of publication of the previous final rule.

The Secretary shall determine in such rule whether to amend the standards in effect for such products.

"(E) Standards amended pursuant to subparagraph (D) shall apply only to products manufactured beginning—

"(i) no earlier than five and no later than ten years after the effective date of the previous amendment; or

"(ii) if the previous final rule did not amend the standard, five years after the earliest date by which the previous amendment could have become effective;

except that in no case may any amended standard apply to products manufactured within five years after publication of the final rule.

"(g) STANDARDS FOR DISHWASHERS; CLOTHES WASHERS; CLOTHES DRYERS.—(1) Dishwashers manufactured on or after January 1, 1988, shall be equipped with an option to dry without heat.

"(2) All rinse cycles of clothes washers shall include an unheated water option, but may have a heated water rinse option, for products manufactured on or after January 1, 1988.

"(3) Gas clothes dryers shall not be equipped with a constant burning pilot for products manufactured on or after January 1, 1988.

"(4)(A) The Secretary shall publish final rules no later than January 1, 1990, to determine if the standards established under this subsection for products described in paragraphs (1), (2), and (3) should be amended. Such rules shall provide that any amendment shall apply to products the manufacture of which is completed on or after January 1, 1993.

"(B) After January 1, 1990, the Secretary shall publish a final rule no later than every five years after the date of publication of the previous final rule. The Secretary shall determine in such rule whether to amend the standards in effect for such products.

"(C) Any such amendment shall apply to products manufactured beginning five years after—

"(i) the effective date of the previous amendment; or "(ii) if the previous final rule did not amend the standard, the earliest date by which a previous amendment could have been in effect;

except that in no case may any amended standard apply to products manufactured within three years after publication of the final rule establishing such amended standard.

"(h) STANDARDS FOR KITCHEN RANGES AND OVENS.—(1) Gas kitchen ranges and ovens having an electrical supply cord shall not be equipped with a constant burning pilot for products manufactured on or after January 1, 1990.

"(2)(A) The Secretary shall publish a final rule no later than January 1, 1992, to determine if the standards established for kitchen ranges and ovens in this subsection should be amended. Such rule shall contain such amendment, if any, and provide that the amendment shall apply to products manufactured on or after January 1, 1995.

"(B) The Secretary shall publish a final rule no later than January 1, 1997, to determine whether standards in effect for such products should be amended. Such rule shall apply to products manufactured on or after January 1, 2000.

"(C) After January 1, 1997, the Secretary shall publish a final rule no later than every five years after the date of publication of a previous final rule. The Secretary shall determine in such rule whether to amend the standards in effect for such product.

"(D) Any amendment prescribed under subparagraph (C) shall apply to products manufactured beginning no earlier than five years after—

"(i) the effective date of the previous amendment; or

"(ii) if the previous final rule did not amend the standard, the earliest date by which a previous amendment could have been in effect;

except that in no case may any amended standard apply to products manufactured within three years after publication of the final rule establishing such standard.

"(i) STANDARDS FOR OTHER COVERED PRODUCTS.—(1) The Secretary may prescribe an energy conservation standard for any type (or class) of covered products of a type specified in paragraph (12) of section 322(a) if the Secretary determines that—

"(A) the average per household energy use within the United States by products of such type (or class) exceeded 150 kilowatt-hours (or its Btu equivalent) for any 12 calendar-month period ending before such determination;

"(B) the aggregate household energy use within the United States by products of such type (or class) exceeded 4,200,000,000 kilowatt-hours (or its Btu equivalent) for any such 12 calendar-month period;

"(C) substantial improvement in the energy efficiency of products of such type (or class) is technologically feasible; and

"(D) the application of a labeling rule under section 324 to such type (or class) is not likely to be sufficient to induce manufacturers to produce, and consumers and other persons to purchase, covered products of such type (or class) which achieve the maximum energy efficiency which is technologically feasible and economically justified.

"(2) Any new or amended standard for covered products of a type specified in paragraph (12) of section 322(a) shall not apply to products manufactured within five years after the publication of a final rule establishing such standard.

"(j) CRITERIA FOR PRESCRIBING NEW OR AMENDED STANDARDS.—(1) The Secretary may not prescribe any amended standard which increases the maximum allowable energy use, or decreases the minimum required energy efficiency, of a covered product.

"(2)(A) Any energy conservation standard prescribed by the Secretary under this section for any type (or class) of covered product shall be designed to achieve the maximum improvement in energy efficiency which the Secretary determines is technologically feasible and economically justified.

"(B)(i) In determining whether a standard is economically justified, the Secretary shall, after receiving views and comments furnished with respect to the proposed standard, determine whether the benefits of the standard exceed its burdens by, to the greatest extent practicable, considering—

"(I) the economic impact of the standard on the manufacturers and on the consumers of the products subject to such standard;

"(II) the savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered products which are likely to result from the imposition of the standard;

"(III) the total projected amount of energy savings likely to result directly from the imposition of the standard;

"(IV) any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard;

"(V) the impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the imposition of the standard;

"(VI) the need for national energy conservation; and

"(VII) other factors the Secretary considers relevant.

"(ii) For purposes of clause (i)(V), the Attorney General shall, not later than 60 days after the publication of a proposed rule prescribing an energy conservation standard, make a determination of the impact, if any, from any lessening of competition likely to result from such standard and shall transmit such determination in writing to the Secretary, together with an analysis of the nature and extent of such impact. Any such determination and analysis shall be published by the Secretary in the Federal Register.

"(iii) If the Secretary finds that the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy savings during the first year that the consumer will receive as a result of the standard, as calculated under the applicable test procedure, there shall be a rebuttable presumption that such standard level is economically justified. A determination by the Secretary that such criterion is not met shall not be taken into consideration in the Secretary's determination of whether a standard is economically justified.

"(3) The Secretary may not prescribe an amended or new standard under this section for a type (or class) of covered product if—

"(A) for products other than dishwashers, clothes washers, clothes dryers, and kitchen ranges and ovens, a test procedure has not been prescribed pursuant to section 323 with respect to that type (or class) of product; or

"(B) the Secretary determines, by rule, that the establishment of such standard will not result in significant conservation of energy or that the establishment of such standard is not technologically feasible or economically justified.

For purposes of section 327, a determination under subparagraph (B) with respect to any type (or class) of covered products shall have the same effect as would a standard prescribed for such type (or class).

"(4) The Secretary may not prescribe an amended or new standard under this section if the Secretary finds (and publishes such finding) that interested persons have established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States in any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States at the time of the Secretary's finding. The failure of some types (or classes) to meet this criterion shall not affect the Secretary's determination whether to prescribe a standard for other types (or classes).

"(k) PROCEDURE FOR PRESCRIBING NEW OR AMENDED STANDARDS.—Any new or amended energy conservation standard shall be prescribed in accordance with the following procedure:

"(1) The Secretary—

"(A) shall publish an advance notice of proposed rulemaking which specifies the type (or class) of covered products to which the rule may apply;

"(B) shall invite interested persons to submit, within 60 days after the date of publication of such advance notice, written presentations of data, views, and arguments in response to such notice; and

"(C) may identify proposed or amended standards that may be prescribed.

"(2) A proposed rule which prescribes an amended or new energy conservation standard or prescribes no amendment or no new standard for a type (or class) of covered products shall be published in the Federal Register. In prescribing any such proposed rule with respect to a standard, the Secretary shall determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for each type (or class) of covered products. If such standard is not designed to achieve such efficiency or use, the Secretary shall state in the proposed rule the reasons therefor.

"(3) After the publication of such proposed rulemaking, the Secretary shall, in accordance with section 336, afford interested persons an opportunity, during a period of not less than 60 days, to present oral and written comments (including an opportunity to question those who make such presentations, as provided in such section) on matters relating to such proposed rule, including—

"(A) whether the standard to be prescribed is economically justified (taking into account those factors which the Secretary must consider under subsection (j)(2)) or will result in the effects described in subsection (j)(4);

"(B) whether the standard will achieve the maximum improvement in energy efficiency which is technologically feasible;

"(C) if the standard will not achieve such improvement, whether the reasons for not achieving such improvement are adequate; and

"(D) whether such rule should prescribe a level of energy use or efficiency which is higher or lower than that which would otherwise apply in the case of any group of products within the type (or class) that will be subject to such standard.

"(4) A final rule prescribing an amended or new energy conservation standard or prescribing no amended or new standard for a type (or class) of covered products shall be published as soon as is practicable, but not less than 90 days, after publication of the proposed rule in the Federal Register.

"(l) SPECIAL RULE FOR CERTAIN TYPES OR CLASSES OF PRODUCTS.—(1) A rule prescribing an energy conservation standard for a type (or class) of covered products shall specify a level of energy use or efficiency higher or lower than that which applies (or would apply) for such type (or class) for any group of covered products which have the same function or intended use, if the Secretary determines that covered products within such group—

"(A) consume a different kind of energy from that consumed by other covered products within such type (or class); or

"(B) have a capacity or other performance-related feature which other products within such type (or class) do not have and such feature justifies a higher or lower standard from that which applies (or will apply) to other products within such type (or class).

In making a determination under this paragraph concerning whether a performance-related feature justifies the establishment of a higher or lower standard, the Secretary shall consider such factors as the utility to the consumer of such a feature, and such other factors as the Secretary deems appropriate.

"(2) Any rule prescribing a higher or lower level of energy use or efficiency under paragraph (1) shall include an explanation of the basis on which such higher or lower level was established.

"(m) INCLUSION IN STANDARDS OF TEST PROCEDURES AND OTHER REQUIREMENTS.—An energy conservation standard prescribed under this section shall include, where applicable, test procedures prescribed in accordance with section 323 and may include any requirement which the Secretary determines is necessary to assure that each covered product to which such standard applies meets the required minimum level of energy efficiency or maximum quantity of energy use specified in such standard.

"(n) DETERMINATION OF COMPLIANCE WITH STANDARDS.—Compliance with, and performance under, the energy conservation standards (except for design standards authorized by this Act) provided in, or prescribed pursuant to, this section shall be determined using the test procedures and corresponding compliance criteria prescribed under section 323.

"(o) SMALL MANUFACTURER EXEMPTION.—(1) Subject to paragraph (2), the Secretary may, on application of any manufacturer, exempt such manufacturer from all or part of the requirements of any rule prescribing or amending an energy conservation standard under this section for any period not longer than the 24-month period beginning on the date such rule is effective, if the Secretary finds that the annual gross revenues of such manufacturer from all its operations (including the manufacture and sale of covered products) does not exceed $8,000,000 for the 12-month period preceding the date of the application. In making such finding with respect to any manufacturer, the Secretary shall take into account the annual gross revenues of any other person who controls, is controlled by, or is under common control with, such manufacturer.

"(2) The Secretary may not exercise the authority granted under paragraph (1) with respect to any type (or class) of covered product subject to an energy conservation standard established under this section unless the Secretary makes a finding, after obtaining the written views of the Attorney General, that a failure to allow an exemption under paragraph (1) would likely result in a lessening of competition.".

SEC. 6. REQUIREMENTS OF MANUFACTURERS.

Section 326(d) of the Energy Policy and Conservation Act (42 U.S.C. 6296(d)) is amended to read as follows:

"(d) INFORMATION REQUIREMENTS.—(1) For purposes of carrying out this part, the Secretary may require, under this part or other provision of law administered by the Secretary, each manufacturer of a covered product to submit information or reports to the Secretary with respect to energy efficiency or energy use of such covered product and the economic impact of any proposed energy conservation standard, as the Secretary determines may be necessary to establish and revise test procedures, labeling rules, and energy conservation standards for such product and to insure compliance with the requirements of this part. In making any determination under this paragraph, the Secretary shall consider existing public sources of information, including nationally recognized certification programs of trade associations.

"(2) The Secretary shall exercise authority under this section in a manner designed to minimize unnecessary burdens on manufacturers of covered products.

"(3) The provisions of section 11(d) of the Energy Supply and Environmental Coordination Act of 1974 shall apply with respect to information obtained under this subsection to the same extent and in the same manner as they apply with respect to energy information obtained under section 11 of such Act.".

SEC. 7. EFFECT ON OTHER LAW.

Section 327 of the Energy Policy and Conservation Act (42 U.S.C. 6297) is amended to read as follows:

"EFFECT ON OTHER LAW

"SEC. 327. (a) PREEMPTION OF TESTING AND LABELING REQUIREMENTS.—(1) Effective on the date of enactment of the National Appliance Energy Conservation Act of 1986, this part supersedes any State regulation insofar as such State regulation provides at any time for the disclosure of information with respect to any measure of energy consumption of any covered product if—

"(A) such State regulation requires testing or the use of any measure of energy consumption or energy descriptor in any manner other than that provided under section 323; or

"(B) such State regulation requires disclosure of information with respect to the energy use or energy efficiency of any covered product other than information required under section 324.

"(2) For purposes of this section, the term 'State regulation' means a law or regulation of a State or its political subdivisions.

"(b) GENERAL RULE OF PREEMPTION FOR ENERGY CONSERVATION STANDARDS BEFORE FEDERAL STANDARD BECOMES EFFECTIVE FOR A PRODUCT.—Effective on the date of enactment of the National Appliance Energy Conservation Act of 1986 and ending on the effective date of an energy conservation standard established under section 325 for any covered product, no State regulation or other requirement, or revision thereof, concerning the energy efficiency or energy use of the covered product shall be applicable to such product unless the State regulation, requirement, or revision—

"(1) was prescribed or enacted before January 8, 1987, and is applicable to products before January 3, 1988;

"(2) is a State procurement regulation described in subsection (e);

"(3) is a regulation or requirement described in subsection (f)(1) or is prescribed or enacted in a building code for new construction described in subsection (f)(2); or

"(4) is a regulation prohibiting the use in pool heaters of a constant burning pilot; or

"(5) is a regulation described in subsection (d)(5)(B) for which a waiver has been granted under subsection (d).

"(c) GENERAL RULE OF PREEMPTION FOR ENERGY CONSERVATION STANDARDS WHEN FEDERAL STANDARD BECOMES EFFECTIVE FOR A PRODUCT.—Effective on the effective date of an energy conservation standard established under section 325 for any covered product, no State regulation or other requirement, or revision thereof, concerning the energy efficiency or energy use of such covered product shall be applicable to such product unless the regulation, requirement, or revision—

"(1) is a regulation described in paragraph (2) or (4) of subsection (b);

"(2) is a regulation which has been granted a waiver under subsection (d); or

"(3) was prescribed or enacted in a building code for new construction described in subsection (f)(3).

"(d) WAIVER OF FEDERAL PREEMPTION.—(1)(A) Any State with a State regulation which provides for any energy conservation standard or other requirement with respect to energy use or energy efficiency for any type (or class) of covered product for which a Federal energy conservation standard is applicable under section 325 may file a petition with the Secretary requesting a rule that such State regulation become applicable to such covered product.

"(B) Subject to paragraphs (2) through (5), the Secretary shall, within the period described in paragraph (2) and after consideration of the petition and the comments of interested persons, prescribe such rule if the Secretary finds (and publishes such finding) that the State has established by a preponderance of the evidence that such State regulation is needed to meet unusual and compelling State or local energy conditions.

"(C) For purposes of this subsection, the term 'unusual and compelling State or local energy conditions' means conditions which—

"(i) are substantially different in nature or magnitude than those prevailing in the United States generally; and

"(ii) are such that the costs, benefits, burdens, and reliability of energy savings resulting from the State regulation make such regulation preferable or necessary when measured against the costs, benefits, burdens, and reliability of alternative approaches to energy savings or production, including reliance on reasonably predictable market-induced improvements in efficiency of all products subject to the State regulation.

The factors described in clause (ii) shall be evaluated as part of the State's energy plan and forecast.

"(2) The Secretary shall give notice of any petition filed under paragraph (1) and afford interested persons a reasonable opportunity to make written comments, including rebuttal comments, thereon. The Secretary shall, within the six-month period beginning on the date on which any such petition is filed, deny such petition or prescribe the requested rule, except that the Secretary may publish a notice in the Federal Register extending such period to a date certain but no longer than one year after the date the petition was filed. Such notice shall include the reasons for delay. In the case of any denial of a petition under this subsection, the Secretary shall publish in the Federal Register notice of such denial and the reasons for such denial.

"(3) The Secretary may not prescribe a rule under paragraph (2) if the Secretary finds (and publishes such finding) that interested persons have established, by a preponderance of the evidence, that such State regulation will significantly burden manufacturing, marketing, distribution, sale, or servicing of affected products on a national basis. In determining whether to make such finding, the Secretary shall evaluate all relevant factors, including—

"(A) the extent to which the State regulation will increase manufacturing or distribution costs of affected businesses;

"(B) the extent to which the State regulation will disadvantage smaller manufacturers, distributors, or dealers or lessen competition in the sale of subject products in the State; and

"(C) the extent to which the State regulation would cause a burden to manufacturers to redesign and produce the subject product type (or class), taking into consideration the extent to which the regulation, if applied to the State or to the entire United States, would result in a reduction—

"(i) in the current models or in the projected availability of models that could be shipped on the effective date of the regulation; or

"(ii) in the current or projected sales volume of the subject product type (or class);

"(D) the extent to which the State regulation is likely to contribute significantly to a proliferation of State appliance efficiency requirements and the cumulative impact such requirements would have.

"(4) The Secretary shall not prescribe a rule pursuant to paragraph (1) if the Secretary finds (and publishes such finding) that interested persons have established, by a preponderance of the evidence, that the State regulation is likely to result in the unavailability in the State of any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the State at the time of the Secretary's finding except that the failure of some classes (or types) to meet this criterion shall not affect the Secretary's determination whether to prescribe a rule for other classes (or types).

"(5) No final rule prescribed by the Secretary pursuant to paragraph (2) may—

"(A) permit any State regulation covered by such rule to apply to any covered product manufactured within three years after such rule is published in the Federal Register or within five years if the Secretary finds that such additional time is necessary due to the substantial burdens of retooling, redesign, or distribution needed to comply with the State regulation; or

"(B) apply to a covered product manufactured before the earliest possible effective date specified in section 325 for the initial amendment of the energy conservation standard established under such section for the covered product; except that such rule may apply before such date if the Secretary finds (and publishes such finding) that the State has established, by a preponderance of the evidence, that—

"(i) because of circumstances not reasonably foreseeable by the State, an energy emergency condition exists within the State which—

"(I) imperils the health, safety, and welfare of its residents because of the inability of the State or utilities within the State to provide adequate quantities of gas or electric energy to its residents at less than prohibitive costs; and

"(II) cannot be substantially alleviated by the importation of energy or the use of interconnection agreements; and

"(ii) the State regulation is necessary to substantially alleviate such condition.

"(6) In any case in which a State is issued a rule under paragraph (1) with respect to a covered product and subsequently a Federal energy conservation standard concerning such product is amended pursuant to section 325, any person subject to such State regulation may file a petition with the Secretary requesting the Secretary to withdraw the rule issued under paragraph (1) with respect to such product in such State. The Secretary shall consider such petition in accordance with the requirements of paragraphs (1), (3), and (4), except that the burden shall be on the petitioner to show by a preponderance of the evidence that the rule received by the State under paragraph (1) should be withdrawn as a result of the amendment to the Federal standard. If the Secretary determines that the petitioner has shown that the rule issued by the State should be so withdrawn, the Secretary shall withdraw it.

"(e) EXCEPTION FOR CERTAIN STATE PROCUREMENT STANDARDS.—Any State regulation which sets forth procurement standards for a State (or political subdivision thereof) shall not be superseded by the provisions of this part if such State standards are more stringent than the corresponding Federal energy conservation standards.

"(f) EXCEPTION FOR CERTAIN BUILDING CODE REQUIREMENTS.—(1) A regulation or other requirement enacted or prescribed before January 8, 1987, that is contained in a State or local building code for new construction concerning the energy efficiency or energy use of a covered product is not superseded by this part until the effective date of the energy conservation standard prescribed in section 325 for such covered product.

"(2) A regulation or other requirement, or revision thereof, contained in a State or local building code for new construction concerning the energy efficiency or energy use of a covered product and enacted or prescribed on or after January 8, 1987, is not superseded by this part until the effective date of the energy conservation standard prescribed in section 325 for such covered product if the code does not require that the energy efficiency of such covered product exceed—

"(A) the applicable minimum efficiency requirement in a national voluntary consensus standard, or

"(B) the minimum energy efficiency level in a regulation or other requirement of the State meeting the requirements of subsections (b)(1) or (b)(5),

whichever is higher.

"(3) Effective on the effective date of an energy conservation standard for a covered product prescribed in or authorized under section 325 a regulation or other requirement contained in a State or local building code for new construction concerning the energy efficiency or energy use of such covered product is not superseded by this part if the code complies with all of the following requirements:

"(A) The code permits a builder to meet an energy consumption objective for a building by selecting items whose combined energy efficiencies meet the objective.

"(B) The code does not require that the covered product have an energy efficiency exceeding the applicable energy conservation standard under section 325, except that the required efficiency may exceed such standard up to the level required by a regulation of that State for which the Secretary has issued a rule granting a waiver under paragraph (d).

"(C) The credit to the energy consumption objective allowed by the code for installing covered products having energy efficiencies exceeding such energy conservation standard under section 325 or the efficiency level required in a State regulation referred to in subparagraph (B) is on a one-for-one equivalent energy use basis.

"(D) If the code uses one or more baseline building designs against which all submitted building designs are to be evaluated and such baseline building designs contain a covered product subject to an energy conservation standard under section 325, the baseline building designs are based on the efficiency level for such covered product which meets but does not exceed such standard or the efficiency level required by a regulation of that State for which the Secretary has issued a rule granting a waiver under paragraph (d).

"(E) If the code sets forth one or more optional combinations of items which meet the energy consumption objective, for every combination which includes a covered product the efficiency of which exceeds either standard or level referred to in subparagraph (D), there also shall be at least one combination which includes such covered product the efficiency of which does not exceed such standard or level by more than 5 percent, except that at least one combination includes such covered product the efficiency of which meets but does not exceed such standard.

"(F) The code does not arbitrarily attempt to promote or discourage use of any type of covered product.

"(G) The energy consumption objective is specified in terms of an estimated total consumption of energy utilizing an equivalent amount of energy (which may be specified in units of energy or its equivalent cost).

"(H) The estimated energy use of any covered product permitted or required in the code, or used in calculating the objective, is determined using the applicable test procedures prescribed under section 323, except that the estimated energy use calculation may be adjusted to reflect the conditions of the areas where the code is being applied, if such adjustment is based on the use of the applicable test procedures prescribed under section 323 or other technically accurate documented procedure.

"(4)(A) Subject to subparagraph (B), a State or local government is not required to submit a petition to the Secretary in order to enforce or apply its building code or to establish that the code meets the conditions set forth in this subsection.

"(B) If the building code requires the installation of covered products with efficiencies exceeding both the applicable Federal standard under section 325 and any applicable standard of such State that has been granted a waiver under subsection (d), such requirement of the building code shall not be applicable unless the Secretary has granted a waiver for such requirement under subsection (d).

"(g) No Warranty.—Any disclosure with respect to energy use, energy efficiency, or estimated annual operating cost which is required to be made under the provisions of this part shall not create an express or implied warranty under State or Federal law that such energy efficiency will be achieved or that such energy use or estimated annual operating cost will not be exceeded under conditions of actual use.".

SEC. 8. CITIZEN SUITS.

Section 335(a) of the Energy Policy and Conservation Act (42 U.S.C. 6305) is amended—

(1) by striking out "or" at the end of paragraph (1);

(2) by striking out the period at the end of paragraph (2) and inserting in lieu thereof "; or";

(3) by inserting after paragraph (2) the following new paragraph:

"(3) the Secretary in any case in which there is an alleged failure of the Secretary to comply with a nondiscretionary duty to issue a proposed or final rule according to the schedule set forth in section 325."; and

(4) by adding after the last sentence the following: "The courts shall advance on the docket, and expedite the disposition of, all causes filed therein pursuant to this paragraph (3). If the court finds that the Secretary has failed to comply with a deadline under section 325, the court shall have jurisdiction to order appropriate relief, including relief that will ensure the Secretary's compliance with future deadlines for the same covered product.".

SEC. 9. ADMINISTRATIVE REVIEW AND JUDICIAL REVIEW.

Section 336 of the Energy Policy and Conservation Act (42 U.S.C. 6306) is amended to read as follows:

"ADMINISTRATIVE PROCEDURE AND JUDICIAL REVIEW

"SEC. 336. (a)(1) In addition to the requirements of section 553 of title 5, United States Code, rules prescribed under section 323, 324, 325, 327, or 328 of this part shall afford interested persons an opportunity to present written and oral data, views, and arguments with respect to any proposed rule.

"(2) In the case of a rule prescribed under section 325, the Secretary shall, by means of conferences or other informal procedures, afford any interested person an opportunity to question—

"(A) other interested persons who have made oral presentations; and

"(B) employees of the United States who have made written or oral presentations with respect to disputed issues of material fact.

Such opportunity shall be afforded to the extent the Secretary determines that questioning pursuant to such procedures is likely to result in a more timely and effective resolution of such issues.

"(3) A transcript shall be kept of any oral presentations made under this subsection.

"(b)(1) Any person who will be adversely affected by a rule prescribed under section 323, 324, or 325 may, at any time within 60 days after the date such rule is prescribed, file a petition with the United States court of appeals for the circuit in which such person resides or has his principal place of business, for judicial review of such rule. A copy of the petition shall be transmitted by the clerk of the court to the agency which prescribed the rule. Such agency shall file in the court the written submissions to, and transcript of, the proceedings on which the rule was based, as provided in section 2112 of title 28, United States Code.

"(2) Upon the filing of the petition referred to in paragraph (1), the court shall have jurisdiction to review the rule in accordance with chapter 7 of title 5, United States Code, and to grant appropriate relief as provided in such chapter.

No rule under section 323, 324, or 325 may be affirmed unless supported by substantial evidence.

"(3) The judgment of the court affirming or setting aside, in whole or in part, any such rule shall be final, subject to review by the Supreme Court of the United States upon certiorari or certification as provided in section 1254 of title 28, United States Code.

"(4) The remedies provided for in this subsection shall be in addition to, and not in substitution for, any other remedies provided by law.

"(5) The procedures applicable under this part shall not—

"(A) be considered to be modified or affected by any other provision of law unless such other provision specifically amends this part (or provisions of law cited herein); or

"(B) be considered to be superseded by any other provision of law unless such other provision does so in specific terms by referring to this part and declaring that such provision supersedes, in whole or in part, the procedures of this part.

"(c) Jurisdiction is vested in the Federal district courts of the United States over actions brought by any adversely affected person to determine whether a State or local government is complying with the requirements of this part.".

SEC. 10. ANNUAL REPORT.

Section 338 of the Energy Policy and Conservation Act (42 U.S.C. 6308) is amended by adding the following at the end: "Nothing in this section provides a defense or justification for a failure by the Secretary to comply with a nondiscretionary duty as provided for in this Act.".

SEC. 11. CONFORMING AMENDMENTS.

Part B of the Energy Policy and Conservation Act is amended as follows:

(1) Section 324 is amended—

(A) in subsection (a)(1), by striking out "paragraphs (1) through (9)" and inserting in lieu thereof "paragraphs (1) through (11)";

(B) by striking out paragraph (2) of subsection (a), and by redesignating paragraphs (3) and (4) as paragraphs (2) and (3);

(C) in paragraph (2) of subsection (a), as redesignated by subparagraph (B)—

(i) by striking out "paragraph (14)" and inserting in lieu thereof "paragraph (12)";

(ii) by striking out subparagraph (A) and inserting in lieu thereof the following:

"(A) the Commission or the Secretary has made a determination with respect to such type (or class thereof) that labeling in accordance with this section will assist purchasers in making purchasing decisions,"; and

(iii) by striking out "section 323(a)" in subparagraph (B) and inserting in lieu thereof "323(b)(1)(B)";

(D) by striking out subsection (b)(1) and inserting in lieu thereof the following:

"(b)(1)(A) Any labeling rule in effect on the date of the enactment of the National Appliance Energy Conservation Act of 1986 shall remain in effect until amended, by rule, by the Commission.

"(B) Not later than 30 days after the date on which a proposed test procedure applicable to a covered product of any of the types specified in paragraphs (1) through (12) of section 322(a) (or class thereof) is prescribed under section 323(b) after the date of the enactment of the National Appliance Energy Conservation Act of 1986, the Commission shall publish a proposed labeling rule applicable to such type (or class thereof).";

(E) in subsection (b)(3)—

(i) by striking out "section 323" both places in which it appears and inserting in lieu thereof "section 323(b)";

(ii) by striking out "(13)" and inserting in lieu thereof "(11)"; and

(iii) by striking out "(14)" and inserting in lieu thereof "(12)"; and

(F) in subsection (b)(5), by striking out "(13)" and "(14)" and inserting in lieu thereof "(11)" and "(12)", respectively.

(2) Section 326(b)(3)(A) is amended by inserting "contained in or" before "prescribed under".

(3) Section 332(a)(5) of such Act is amended by striking out "energy efficiency standard prescribed under" and inserting in lieu thereof "energy conservation standard contained in or prescribed under".

STATEMENT OF SEN. J. BENNETT JOHNSTON

Appliance Efficiency Hearing: S.2781

September 16, 1986

I congratulate the Chairman for promptly scheduling hearings on S.2781, the National Appliance Energy Conservation Act of 1986. I hope we will be able to address the bill in markup as promptly.

The very interesting and unusual coalition of industry, State and environmental interests that has produced this legislation deserves a response from the Committee to their proposal.

In many respects the provisions of S. 2781 resemble the original legislation that directed the Department of Energy to promulgate appliance efficiency standards in the late 1970's.

Then, as now, there was a perception that standards would result in energy savings that the market might not provide.

Then, as now, States were showing considerable interest in establishing standards as a way of capturing the benefits of energy conservation for their citizens.

Then, as now, the industry was seeking relief from a potential patchwork of State regulation that threatened to make design and marketing of appliances much more costly and difficult.

Then, as now, the quid pro quo for the preemption of State standards was establishment of uniform, achievable Federal standards.

The policy of the 1970's was never implemented because the Administration, with some considerable encouragement from the industry, refused to promulgate the required Federal standards. A clash of conservative ideology led us in a complete 360-degree circle to where we are today. Free-market conservative ideology abhors Federal standards. States-rights conservative ideology abhors preemption of State law. It has taken years to recreate the conditions that led to the original appliance efficiency legislation, but this Administration has done the job.

We now have States moving aggressively to promulgate energy efficiency standards for new appliances. These standards, inevitably, given the vacuum in Federal leadership, will impose a considerable burden on the appliance industry. Consumers have lost years during which the more efficient appliances this legislation would mandate could have been saving them money. And this has happened as a direct and entirely forseeable result of Administration policy.

Having recreated the problem, the Adminstration has done nothing to develop the solution to it that is being presented to the Committee today. The Administration has simply been irrelevant.

The solution we are considering today has been developed by an extraordinary coalition of industry and environmentalists and other interested parties who, in effect, are playing the role that the Administration is supposed to play in our form of Federal government. This coalition has negotiated a proposal that addresses the national interest in energy conservation, the industry interest in rational regulation and the State interest in protection of its citizens. This coalition has come to Congress with its case for reform because there is no way that an Administration that is so beset with contradictory ideological impulses could deal with its problems.

I hope we can deal with them. This legislation will certainly lead to less regulation. It will save energy and it will save resources.

It is a shame that, with its ideological blinders so firmly in place, the Administration cannot contribute to these worthy goals.

STATEMENT BY SENATOR ALAN CRANSTON
TO THE SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES ON S. 2781, TO ESTABLISH NATIONAL APPLIANCE STANDARDS

September 16, 1986

Mr. Chairman:

I am delighted to provide this testimony on behalf of S. 2781 -- a bill I originally co-sponsored -- to set national energy conservation standards for major household appliances.

I thank the Chairman for his prompt scheduling of hearings on the matter. And I also want to thank my distinguished colleague from Washington (Mr. EVANS) and the other Senators who joined in introducing this important legislation.

This bill is a substantial revision of S. 1360, a bill I introduced in June, 1985.

Since then, extensive negotiations have occurred, and S. 2781 has the complete support of the trade associations representing the appliance industry, as well as the National Resources Defense Council and other groups primarily interested in conserving energy and other precious natural resources.

It is several years since the term 'energy crisis' echoed through our homes as we faced the last energy shortage. But, we still have not insured that America will have sufficient, affordable, clean energy to meet our future needs.

S. 2781, the National Appliance Energy Conservation Act of 1986, is an important step toward insuring America's energy future. By eliminating the least efficient appliances in the market-place, this bill will, by 1993, cause major appliances to be at least 15-25 percent more efficient than the average appliance sold in 1985. In addition, there are other near-term benefits for the American people.

*First, it will benefit consumers who operate new energy-efficient appliances, because they will save money on their electric bills. One-third of the energy we use in our homes operates electrical appliances and this percentage is increasing.

*Second, utility ratepayers and shareholders will benefit, because as consumers use more efficiently the electricity utilities generate, utilities can avoid building expensive new powerplants to meet anticipated demand increases, and can cut use of inefficient, costly-to-run powerplants. Just replacing with high-efficiency models the 12 million refrigerators and freezers Californians owned in 1982 will enable California consumers to reduce their energy use by an estimated 5%, about 1,700 megawatts.

The new appliances will cost consumers about $705 million -- much of which people would spend routinely for appliance replacement -- while building new powerplants this size to meet increasing demands for electricity would cost more than $6 billion, more than six times as much.

*Third, with national standards and the strong state preemption language in this bill, manufacturers of major home appliances will avoid facing a rapidly multiplying patchwork of varying standards in each state in which they choose to do business, and will have their ability to compete in foreign markets enhanced.

This legislation has total support from groups who often have been at odds with one another.

Congress has supported a federal program to improve consumer appliance efficiency since 1975. We mandated national appliance efficiency standards for each of the 13 major household appliances when the Energy Conservation and Policy Act was enacted in November 1978, requiring regulations implementing national standards by December of 1980.

At the time Congress acted, ten States--including California--had already adopted their own appliance efficiency standards.

The contemplated national standards were less stringent than those California already had in place, but because the nation as a whole would have gained from adopting national standards, I supported the national legislation.

However, I fought to make sure that mere passage of the federal law did not preempt prematurely the existing State standards before the federal standards took effect.

Despite the clear Congressional mandate, the Carter Administration left office without adopting the standards, due at the end of their tenure, and, under the Reagan Administration, the Department of Energy has claimed to meet the requirements for national efficiency standards by adopting regulations that say that no standards are necessary. In terms of encouraging increased energy efficiency, these standards are meaningless, if not counterproductive.

Meanwhile--to avoid preemption by these nonstandards, states such as California, Florida, New York, and Kansas, among others with their own standards, successfully petitioned the Administration for exemption, in effect restoring the situation that existed before the Reagan Administration's national regulations were adopted.

Then, several of the states, along with the National Resources Defense Council and the Consumers Union, succeeded, in 1984, in over-turning the Reagan Administration "no-standard standards" in the courts.

This created a troublesome situation. Appliance manufacturers faced proliferating state standards to fill the void left by federal regulators. In California, for example, state standards had worked so effectively that the state legislature decided to broaden them. Manufacturers also faced unpredictable future changes in the federal regulations by subsequent Administrations more responsive to the need for energy conservation.

Meanwhile, conservationists were unhappy with the inadequate federal standards.

By adopting clear national standards that meet the needs of the states, this bill will satisy each of these interests.

At the same time, the bill preserves the ability of states to respond to substantial or unusual local energy problems, such as high electricity, gas, high dependence on oil (or fuels whose price is tied to oil), unusual climatic conditions, or adverse environmental or health and safety conditions that can be alleviated by energy-saving appliances, within the regulatory scheme.

The energy savings at stake are very substantial. Before California adopted its appliance efficiency standards, refrigerators and refrigerator-freezers consumed 12 billion kilowatt hours of electricity each year, according to the California Energy Commission.

But in 1983, as a result of the appliance standards on refrigerators and refrigerator-freezers, residential users saved around 213 million kilowatt hours of electricity.

Consumers save $18 million in operating costs on refrigerators alone.

In 1983, an efficient central air conditioner retailed for about $225 more than a non-efficient one. Eighty percent or more of air-conditioner purchases are made by builders or apartment house owners--who often seek the lowest cost appliances available and do not necessarily benefit from lower utility bills. To them, the higher price of efficient appliances is a disincentive to purchase an energy-efficient air-conditioner, even when the cost can be passed along to the ultimate users of the appliances.

But, a consumer using an energy-efficient air conditioner saved about $47 on utility bills in California in 1983 alone.

Over the expected 13-year average life-cycle of a central air conditioner, a consumer would save $611 on utility bills, benefiting by $386, despite the initial higher cost of his appliance. Yet, information on so-called "life-cycle costing" in the past was not readily available when consumers purchased their own appliances, and often not considered when purchases were made by others. This bill leaves in place the provisions of law which address both of those problems.

The total savings on all home appliances covered by California's efficiency regulations -- central and room air conditioners, gas and electric water heaters, gas space heaters, refrigerators, refrigerator-freezers -- exceeded $173 million in 1983.

And, California's electric power utilities saved the energy equivalant of 2 million barrels of oil that year which they would have otherwise wasted but for more efficient appliances in use in the state. That means cost savings to ratepayers of some $50 million, plus a substantial expansion of our available energy supply.

Of course, those who aquire energy efficient appliances will save the most.

According to the American Council for an Energy Efficient Economy, passage of this bill will enable the average American household to save over $250, and the economy to save a total of 22,000 megawatts of electricity -- the equivalent of the peak output of 22 larger powerplants -- between now and the year 2000.

S. 2781 sets out timetables for implementing standards by 1990, 1992, or 1993, depending on the appliance, and for regular review by the Department of Energy. By "grandfathering" state standards in effect as of January 8, 1987, until federal standards take effect, the bill protects valid state regulatory interests. It also preserves energy-saving building code provisions relating to appliances adopted before January 8, 1987.

Several manufacturers of fuel-efficient appliances have already demonstrated that they can meet the standards this bill would require.

Why not then just leave the energy savings to informed consumers and the free operation of the marketplace, as some suggest?

*First, because the state regulations have restructured the marketplace.

*Second, because the stimulus-response relationship between utility fuel prices, consumer electricity costs and the purchase of electrical appliances by utility customers is too indirect.

*Third, because about 80% of major residential appliances are purchased by builders, apartment house owners and others attracted by lower appliance costs, not by net cost savings over the life of the appliances.

*Fourth, because the information to calculate accurately "life-cycle" cost benefits of efficient appliances is not readily available.

*Fifth, because energy prices do not rise in constant trend lines. They fluctuate. But the national interest in using our energy resources efficiently is constant.

DOE now estimates that new powerplants --which will be needed unless projected electric demand is reduced -- could cost utility ratepayers upwards of $1.8 trillion by the end of the century.

With efficient appliances much of this capital expenditure and wasteful use of energy resources can be eliminated.

Under California's new standards alone, which take effect in 1987 and 1988, the need for new electric generation capacity will be reduced by almost 1,000 megawatts in 1996. Savings of the equivilant of an additional 7 million barrels of oil in 1988 will result just from these recently adopted improvements in the state's appliance efficiency standards. These savings will not be affected by our bill, which will phase in national standards of equivalent stringency from 1988 to 1993.

Manufacturers will be able to meet the standards without undue hardship, and consumers, utilities, industry and the environment all will benefit.

National use of efficient electric appliances will save consumers billions of dollars, ease utility load management problems -- especially during peak periods -- hold down future energy costs, free capital for other purposes, and permit the rapid and least costly reduction of emissions from coal-fired plants responsible for so much acid rain damage. We can provide for our future energy needs without endangering our environment.

I understand that this bill is now on a very fast track in both Houses. I urge the Committee to complete its work and report this bill to the floor as soon as possible.

I thank the Committee for the opportunity to present these views.

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Senator EVANS. Senator Hecht, I am delighted that you are here. Do you have any opening statement?

Senator HECHT. Thank you, but no, sir, no statement.

Senator EVANS. With that, let me introduce the first panel: Mr. Robert Gilbert, president and CEO of the Rheem Manufacturing Co., representing Air-Conditioning & Refrigeration Institute; Mr. Charles Dowd, president, Admiral Division of the Maytag Corp., representing the Association of Home Appliance Manufacturers; Mr. Robert Bauer, president, Empire Comfort Systems, Inc., representing Gas Appliance Manufacturers Association; Dr. David Goldstein, senior scientist, Natural Resources Defense Council; Mr. Howard Geller, associate director, American Council for an Energy-Efficient Economy; Mr. William Butler, vice president for governmental relations, National Audubon Society; Mr. David Corcoran, president, R.B. Corcoran Co., representing the American Supply Association.

So let us begin with Mr. Gilbert and go through the witnesses as I have introduced them.

Mr. Gilbert, please start.

STATEMENT OF ROBERT B. GILBERT, PRESIDENT AND CHIEF EXECUTIVE OFFICER, RHEEM MANUFACTURING CO., ON BEHALF OF THE AIR-CONDITIONING REFRIGERATION INSTITUTE

Mr. GILBERT. Mr. Chairman and members of the subcommittee, my name is Robert B. Gilbert, and I am president and chief executive officer of Rheem Manufacturing Co., a major manufacturer of central air-conditioning equipment, heat pumps, furnaces, and water heaters. I am currently an officer of the Air-Conditioning & Refrigeration Institute and former chairman of the Gas Appliance Manufacturers Association.

I appreciate the opportunity to appear here today on behalf of the Air-Conditioning & Refrigeration Institute, representing the manufacterers of central air-conditioners and heat pumps. I speak for 25 domestic manufacturers who are responsible for over 98 percent of those products produced in this country.

Our industry supports the production and sale of efficient energy-saving equipment. Given the choice, we would prefer to have no mandatory regulation of equipment efficiencies, believing that market forces will continue to drive efficiencies upward.

The average efficiency of our products have increased by 25 percent in the past 10 years, all this largely in the absence of legislation. Why, then, do we now advocate the legislation you are considering? Very simply, it is because the alternatives we face are unsatisfactory. In the absence of Federal standards and without any Federal restrictions on State activities, varying efficiency standards are being enacted in more and more States.

Eventually, we could see many States with their own mandatory efficiency standards. The results of that would be a framentation of an efficient national market into so many markets as to be virtually unmanageable, each with its own rules and each subject to change at unpredictable intervals.

Please try to imagine what the automobile industry would face if each state were allowed to establish its own mandatory gas mileage standards for autos sold in that state. Such a development makes no more sense for the appliance industry than it does for the auto industry. We need an open and competitive nationwide market.

The manufacturers of air-conditioners and heat pumps already have a difficult time keeping up with the frequent modernization and upgrading required to remain competitive even in a stable and unfragmented national marketplace. It takes a lot of time and money to develop a new model, test it thoroughly in company laboratories in accordance with a rigorous Department of Energy test criteria, subject it to the lengthy process of safety testing by independent laboratories, and finally obtain and install the tooling necessary to put the new model into production.

When you realize that each air-conditioner model is actually a family of six or eight different units, each of a different size and capacity, and that each of these units must be offered as a combination with half a dozen or more indoor coil units to fit varying applications, I think you can begin to appreciate the complexity of the task.

Our industry, like the automobile industry, needs national economies of scale in order to produce the most efficient product at the lowest cost for the consumer. When the nationwide market is chopped up into small pieces, the whole process becomes chaotic, terribly expensive, inefficient and very risky. More frequent model changes will mean more frequent redesign, retooling and shorter production runs. The result of that will be higher costs and eventually higher prices for the consumer, perhaps 10 to 20 percent per unit. The result probably also will be the inability of some companies to maintain a foothold in the market and survive.

In short, if we are going to be regulated, and we are being regulated today in more and more States, then the only way to go is Federal regulation. This is best for the country and for the States as well. Certainly, it is best for the consumers, because with a nationwide market, they will get the best value for their money in purchasing these appliances.

We absolutely must have an unfragmented nationwide market to make rational business plans and remain efficient. Some may ask why not allow national standards to emerge from the DOE rulemaking process which must be reaccomplished in light of the ruling by the District of Columbia Court of Appeals last year. The problems with this approach are many. It would be costly, not only for the taxpayers but for the industry. It would be time consuming, and the outcome may not be satisfactory.

I believe that all states will come to appreciate the benefits of the national standard and provision for future review and revisions contained in the legislation. Not only will these standards meet the needs of all states, but they will be far easier to enforce. With national standards, the burden of compliance will be on manufacturers rather than on wholesalers and dealers, as is now the case with State standards. Compliance is not a big problem with national standards. It has already proven to be a big problem with State standards.

The proposed legislation provides for an adequate period of time to prepare for meeting the standards. It provides a satisfactory period of stability, during which the standards do not change. It limits further State regulation now and provides the certainty of future Federal standards which should respond to the legitimate needs of all States. It provides standards level which manufacturers can meet not only technologically but also financially.

Finally, the standards will provide buyers with very efficient equipment at competitive costs while still leaving some latitude for the purchase of more efficient equipment by those who need if. If the minimum efficiency standard is 10 for air-conditioners, eventually there will be some 11's and 12's offered for sale in the marketplace, and they will be promoted by producers and dealers. That is the way it should be in a truly competitive market.

Our members unanimously support S. 2781. I know that most wholesalers and dealers also support it. We urge its enactment this year.

Mr. Chairman, before I close I want to stress to you and to the members of the subcommittee the urgency of this matter. The significance of the agreement that exists presently between the traditional adversaries on this issue cannot be overstated, nor can I overstate the fragile nature of this agreement. If Congress does not act this year, then I am afraid the uncertainty we are trying to avoid through this bill will cause States to once again consider separate regulatory programs next year. This would only result in the diversion of resources and attention of the parties before you today and seriously harm our ability to deal effectively with this issue.

Our request to you and to the entire Congress is to consider this issue a major priority in the closing days of the 99th Congress. I sincerely appreciate your support in this issue, and I look forward to answering any questions you may have.

Thank you.

[The prepared statement of Mr. Gilbert follows:]

ARI AIR-CONDITIONING
& REFRIGERATION
INSTITUTE

Representing Manufacturers
of Heating, Ventilating,
Air-Conditioning and
Refrigeration Products

STATEMENT

OF

ROBERT B. GILBERT

PRESIDENT AND CHIEF EXECUTIVE OFFICER

RHEEM MANUFACTURING COMPANY

ON

S. 2781 THE NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

BEFORE THE

SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION

OF THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

SEPTEMBER 16, 1986

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STATEMENT OF
ROBERT B. GILBERT
BEFORE THE
SUBCOMMITTEE ON ENERGY REGULATIONS AND CONSERVATION
OF THE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

SEPTEMBER 16, 1986

I AM ROBERT B. GILBERT, PRESIDENT AND CHIEF EXECUTIVE OFFICER OF RHEEM MANUFACTURING COMPANY, A MAJOR MANUFACTURER OF CENTRAL AIR CONDITIONERS, HEAT PUMPS, WATER HEATERS, AND FURNACES. I AM ALSO AN OFFICER OF THE AIR-CONDITIONING AND REFRIGERATION INSTITUTE (ARI), THE TRADE ASSOCIATION FOR MANUFACTURERS OF CENTRAL AIR CONDITIONING AND COMMERCIAL REFRIGERATION PRODUCTS, WHICH I AM PRIVILEGED TO REPRESENT HERE TODAY. ARI INCLUDES THE MANUFACTURERS OF OVER 98 PERCENT OF THE RESIDENTIAL CENTRAL AIR CONDITIONERS PRODUCED IN THE UNITED STATES AND REPRESENTED THESE MANUFACTURERS IN NEGOTIATING THE PROPOSED LEGISLATION. MY REFERENCES TO CENTRAL AIR CONDTIONERS INCLUDE HEAT PUMPS.

THE ISSUE OF MANDATORY EFFICIENCY STANDARDS FOR RESIDENTIAL HEATING AND COOLING EQUIPMENT HAS BEEN OF GREAT INTEREST AND CONCERN TO OUR INDUSTRY SINCE 1975 WHEN THE ENERGY POLICY AND CONSERVATION ACT WAS ENACTED. MANUFACTURERS HAVE CONSISTENTLY ENCOURAGED THE PURCHASE OF EFFICIENT SYSTEMS BECAUSE WE SUPPORT OVERALL CONSERVATION OF ENERGY AND BECAUSE EFFICIENT PRODUCTS WILL SAVE MONEY FOR CONSUMERS IN THE LONG RUN. OF COURSE, SUCH PRODUCTS HAVE INCREASED VALUE ADDED IN MANUFACTURING AND HELP INCREASE DOLLAR SALES. IN RESPONSE TO CONSUMER DEMAND CENTRAL AIR CONDITIONERS HAVE BECOME MORE EFFICIENT YEAR AFTER YEAR. THE AVERAGE EFFICIENCY OF ALL UNITS SOLD IN 1985 WAS ABOUT 25 PERCENT HIGHER THAN THE AVERAGE OF SIMILAR UNITS SOLD TEN YEARS EARLIER, AND EFFICIENCIES ARE CONTINUING TO INCREASE. I BELIEVE THAT'S A CREDITABLE RECORD, AND IT WAS ACHIEVED LARGELY IN THE ABSENCE OF MINIMUM SANDARDS.

MOST MANUFACTURERS BELIEVE THE MARKET PLACE PROVIDES THE PREFERRED MECHANISM AND INCENTIVE FOR INCREASING EFFICIENCIES. WE PREFER TO LET THE CONSUMERS TELL US WHAT THEY WANT, AND THEN WE DESIGN OUR PRODUCTS ACCORDINGLY AND VIGOROUSLY COMPETE WITH EACH OTHER FOR THE BUSINESS. FOR THAT REASON, MOST OF US PREVIOUSLY OPPOSED FEDERAL EFFICIENCY STANDARDS.

IF THAT IS SO, WHY DO WE, AS WELL AS MOST WHOLESALERS AND DEALERS, SUPPORT THIS LEGISLATION? VERY SIMPLY, ITS BECAUSE FEDERAL STANDARDS ARE FAR PREFERABLE TO THE MULTITUDE OF STATE REQUIREMENTS NOW DEVELOPING.

IN THE ABSENCE OF FEDERAL STANDARDS WE NOW SEE A GROWING NUMBER OF STATES ENACTING OR CONSIDERING MINIMUM EFFICIENCY STANDARDS FOR MANY OF OUR PRODUCTS SOLD IN THEIR STATES. THIS EMERGING SITUATION IS BEGINNING TO DECIMATE THE FREE AND EFFICIENT NATIONAL MARKET WHICH HAS BEEN SO EFFECTIVE IN PROMOTING VIGOROUS COMPETITION AND EFFICIENT PRODUCTION OF PRODUCTS AT THE LOWEST POSSIBLE COST. IF A NUMBER OF STATES INSIST ON PURSUING THIS COURSE OF ACTION--AND IT TAKES ONLY A FEW TO DESTROY THE NATION-WIDE MARKET--THEN WE ABSOLUTELY MUST HAVE OVERRIDING FEDERAL STANDARDS TO MAINTAIN THE INTEGRITY AND EFFICIENCY OF INTERSTATE COMMERCE IN THESE PRODUCTS. LET ME TRY TO EXPLAIN FURTHER.

PRODUCTS COVERED IN THIS LEGISLATION ARE PRODUCED BY MANUFACTURERS WHO VARY GREATLY IN SIZE AND RESOURCES. MANY ARE SMALL BUSINESSES, PARTICULARLY MANUFACTURERS OF FURNACES AND AIR CONDITIONERS. FOR EXAMPLE, CENTRAL AIR CONDITIONERS ARE MANUFACTURED BY A TOTAL OF 25 DOMESTIC COMPANIES, THE LARGEST WITH MANY THOUSANDS OF EMPLOYEES, THE SMALLEST WITH LESS THAN A HUNDRED. IT IS RARE NOWADAYS TO FIND SUCH SMALL COMPANIES ABLE TO COMPETE DIRECTLY WITH LARGE CORPORATIONS IN MANUFACTURING, AND IN MY VIEW IT'S HEALTHY FOR THE INDUSTRY AND THE COUNTRY. THE MEDIUM AND LARGER MANUFACTURERS DISTRIBUTE THEIR PRODUCTS NATIONWIDE, BUT EVEN THE SMALLEST ONES MAY MARKET IN SEVERAL STATES.

ASSUMING AN OPEN NATIONAL MARKET, WITHOUT STATE STANDARDS, A MEDIUM-SIZED AIR CONDITIONING MANUFACTURER WILL PROBABLY NEED TO OFFER AT LEAST THREE MAJOR LINES, PREFERABLY MORE, EACH AIMED AT A SPECIFIC LEVEL OF THE MARKET IN TERMS OF PERFORMANCE AND EFFICIENCY. WITHIN EACH PRODUCT LINE HE MUST OFFER SEVEN OR EIGHT MODELS OF SUCCESSIVELY INCREASING SIZE AND CAPACITY IN ORDER TO ACCOMMODATE THE VARYING NEEDS OF CUSTOMERS. EACH OF THESE MODELS IS UNIQUE. FOR EACH MODEL IT IS NECESSARY TO OFFER UP TO A DOZEN OR MORE COMBINATIONS OF OUTDOOR CONDENSING UNITS AND INDOOR COIL UNITS TO ACCOMMODATE VARIOUS CONFIGURATIONS OF FURNACES AND AIR HANDLING SYSTEMS WITHIN THE HOME.

IN ORDER TO STAY COMPETITIVE, ALL PRODUCERS, BOTH LARGE AND SMALL, MUST CONSTANTLY REDESIGN AND UPGRADE THE PRODUCTS THEY OFFER. EVEN IN A NORMAL MARKET THIS IS A DEMANDING, EXPENSIVE AND TIME-CONSUMING TASK. EACH NEW MODEL MUST BE DESIGNED, BUILT AND TESTED IN COMPANY LABORATORIES IN COMPLIANCE WITH EXACTING D.O.E. REQUIREMENTS. EACH NEW MODEL MUST BE TESTED AND CERTIFIED FOR SAFETY IN A RECOGNIZED INDEPENDENT LABORATORY SUCH AS UNITED LABORATORIES (UL) OR ETL TESTING LABORATORIES (ETL), A PROCESS WHICH OFTEN TAKES SEVERAL MONTHS. THE DEVELOPMENT OF NEW MODELS IN TODAY'S ENVIRONMENT IS A MAJOR FINANCIAL DECISION FOR ANY PRODUCER.

THE INTRODUCTION OF DIVERSE STATE EFFICIENCY STANDARDS CHANGES A BROAD NATIONAL MARKET INTO VOLATILE AND FRAGMENTED STATE MARKETS, FOR WHICH IT IS VERY DIFFICULT TO MAKE RATIONAL BUSINESS PLANS. IT WOULD BE IMPOSSIBLE FOR EVERYONE TO KEEP UP TO DATE AND TO REDESIGN AND RETOOL WITH THE FREQUENCY REQUIRED TO RESPOND FULLY TO THE RAPIDLY CHANGING SCENE IN ALL MARKETS. IMAGINE, IF YOU WILL, THE IMPACT ON THE AUTO INDUSTRY IF EACH STATE WERE TO IMPOSE ITS OWN MANDATORY GAS MILEAGE STANDARDS ON ALL NEW CARS SOLD IN THAT STATE.

FOR THE MANUFACTURERS WHO ARE ABLE TO SURVIVE AND COMPETE IN AN ENVIRONMENT OF PROLIFERATING STATE REQUIREMENTS, THE RESULT WOULD BE HIGHER COSTS DUE TO FREQUENT REDESIGN AND RETOOLING AND

SMALLER PRODUCTION RUNS--TO THE DETRIMENT OF THE CONSUMER. CONSUMERS IN THIS COUNTRY GET THE GREATEST VALUE WHEN MANUFACTURERS COMPETE VIGOROUSLY WITH EACH OTHER ON A LEVEL PLAYING FIELD AND ARE ABLE TO TAKE FULL ADVANTAGE OF THE TOTAL NATIONAL MARKET, THUS ACHIEVING ECONOMIES OF SCALE IN PRODUCTION. BOTH COMPETITION AND ECONOMIES OF SCALE WILL SUFFER IN THE KIND OF MARKET WHICH WE SEE DEVELOPING IF EACH STATE IS FREE TO ESTABLISH ITS OWN STANDARDS. IT'S ALREADY BEGINNING TO HAPPEN.

IT'S HARD TO QUANTIFY THE COST IMPACT OF NATIONAL MARKET FRAGMENTATION. DEPENDING ON HOW MUCH THE STATE STANDARDS DIFFER AND HOW OFTEN THEY CHANGE, INEFFICIENCIES INHERENT IN SUCH A MARKET MIGHT RAISE UNIT PRODUCTION AND DISTRIBUTION COSTS AS MUCH AS TEN TO TWENTY PERCENT. THE COST INCREASE WOULD VARY WITH MODELS AND VARY AMONG MANUFACTURERS. THE CONSUMER, OF COURSE, MUST ULTIMATELY PAY FOR THE HIGHER COSTS. I AM ALSO CONFIDENT THAT SOME SMALL AND MEDIUM-SIZE COMPANIES WOULD NOT SURVIVE IN THE UNSTABLE COMPETITIVE ENVIRONMENT RESULTING FROM NO FEDERAL STANDARD AND A CONSTANTLY CHANGING KALEIDOSCOPE OF STATE STANDARDS.

SINCE DOE HAS ALREADY INITIATED A RULEMAKING PROCEDURE WHICH MOST OF US BELIEVE WILL ULTIMATELY LEAD TO FEDERAL STANDARDS, ONE MAY ASK LEGITIMATELY WHY NOT ALLOW THAT PROCESS TO CONTINUE AND ESTABLISH FEDERAL STANDARDS IN THAT MANNER. INDUSTRY IS PREPARED TO COOPERATE FULLY WITH DOE, AND IN FACT WE ARE COOPERATING IN THE DOE EVALUATION PROCESS ALREADY UNDERWAY. HOWEVER, WE BELIEVE THAT THE ALTERNATIVE OF ESTABLISHING STANDARDS NOW THROUGH LEGISLATION IS CLEARLY PREFERABLE FOR TWO PRINCIPAL REASONS.

A DOE RULEMAKING PROCESS WILL TAKE SEVERAL YEARS TO COMPLETE. IN THE MEANTIME STATES WILL NOT KNOW WHETHER FEDERAL STANDARDS WILL EVENTUALLY EMERGE OR WHAT THE STANDARDS WILL BE. MORE AND MORE STATES WILL TAKE STEPS TO ESTABLISH THEIR OWN STANDARDS. BY ENACTING FEDERAL STANDARDS NOW, ESTABLISHING FUTURE EFFECTIVE DATES NOW, AND LIMITING FURTHER STATE ACTIVITY AND THE PERCEIVED NEED FOR IT IN VARIOUS STATES, WE CAN ASSURE THE EFFICIENT NATIONAL MARKET PLACE WHICH I HAVE DISCUSSED. WE NEED TO DO THAT NOW BEFORE THE SITUATION BECOMES INTOLERABLE.

WE CAN ALSO AVOID A LENGTHY AND EXPENSIVE RULEMAKING PROCEDURE AND PUT FEDERAL STANDARDS INTO EFFECT MUCH EARLIER THAN WOULD BE THE CASE IN A DOE RULEMAKING. AS YOU KNOW, THE PREVIOUS DOE RULEMAKINGS ON THIS SUBJECT WERE LENGTHY AND CONTROVERSIAL, AND THEY RESULTED IN LITIGATION. IN LIGHT OF THE APPEALS COURT RULING THE ONGOING DOE PROCEEDING IS LIKELY TO BE CONTROVERSIAL AS WELL, AND THE OUTCOME UNCERTAIN. THE PROCEEDINGS WILL BE COSTLY TO TAXPAYERS AND TO INDUSTRY. MEANWHILE MANUFACTURERS WILL BE PLAGUED WITH INCREASING NUMBERS OF STATE STANDARDS AND WILL BE UNABLE TO MAKE PLANS FOR REDESIGNING OR RETOOLING TO MEET THE EVENTUAL FEDERAL STANDARDS WHICH MAY EMERGE.

IF THIS BILL IS ENACTED, MANUFACTURERS CAN IMMEDIATELY BEGIN THE TIME CONSUMING AND EXPENSIVE PROCESS OF REDESIGNING THEIR PRODUCTS AND RETOOLING FOR PRODUCTION IN ORDER TO COMPLY WITH THE STANDARDS ON THE EFFECTIVE DATES. WE MUST HAVE ADEQUATE TIME TO DO THIS BECAUSE A MINORITY OF ALL CURRENT MODELS AVAILABLE WOULD MEET THE 1992 STANDARDS. A LOT OF REDESIGNING AND RETOOLING WILL BE NECESSARY. IF WE WAIT UNTIL A DOE STANDARD IS FINALLY ANNOUNCED, WE WILL THEN NEED FIVE MORE YEARS TO PREPARE FOR THEM IN THE AIR CONDITIONING INDUSTRY. THAT MEANS THE STANDARDS WOULD NOT GO INTO EFFECT UNTIL THE MID '90s OR LATER. LEGISLATION IS THE ONLY WAY TO GET THE STANDARDS ON THE BOOKS IMMEDIATELY AND PERMIT THE REDESIGN PROCESS TO BEGIN NOW.

AN ADDITIONAL CONSIDERATION FAVORING NATIONAL STANDARDS AS OPPOSED TO STATE STANDARDS HAS TO DO WITH COMPLIANCE AND ENFORCEMENT. NATIONAL STANDARDS ARE VIRTUALLY SELF-ENFORCING, BECAUSE THE BURDEN IS ON MANUFACTURERS AND COMPLIANCE IS EASILY VERIFIED. OUR VOLUNTARY CERTIFICATION AND TESTING PROGRAMS, IF DOE CHOOSES TO REFER TO THEM, CAN PERMIT EFFECTIVE MONITORING OF COMPLIANCE AT NO EXPENSE TO THE TAXPAYERS. MOREOVER, NO MANUFACTURER WOULD KNOWINGLY RISK THE LOSS WHICH MIGHT BE SUFFERED IF SOME OF HIS PRODUCTS WERE FOUND TO BE IN VIOLATION OF THE FEDERAL STANDARD. STATE STANDARDS, ON THE OTHER HAND, MUST BE ENFORCED AT THE DEALER OR CONTRACTOR LEVEL. MANY DEALERS AND WHOLESALERS SELL THEIR PRODUCTS ACROSS STATE LINES. ENFORCEMENT WILL BE DIFFICULT AND EXPENSIVE, AND EXPERIENCE ALREADY HAS INDICATED THAT COMPLIANCE WILL BE UNEVEN.

IF ADEQUATE TIME IS PERMITTED FOR REDESIGN, THE REQUIRED EFFICIENCIES CAN BE TECHNOLOGICALLY ACHIEVED BY ALL AIR CONDITIONING MANUFACTURERS. THERE IS SUFFICIENT TIME PROVIDED IN THE PROPOSED LEGISLATION FOR THE NECESSARY REDESIGNING AND RETOOLING, AND THERE IS A REASONABLE PERIOD--SEVEN YEARS--OF STABILITY AFTER THE STANDARDS TAKE EFFECT. THIS PERIOD OF STABILITY, DURING WHICH STANDARDS DO NOT CHANGE, IS PARTICULARLY IMPORTANT FOR US. WE MUST HAVE THIS PERIOD OF TIME DURING WHICH TO AMORTIZE OUR INVESTMENTS IN PRODUCING THE NEW PRODUCTS THAT MEET THE STANDARDS. ANY SHORTER PERIOD WILL CREATE SEVERE BURDENS AND RAISE COSTS.

THE CONSERVATION GROUPS ALLIED WITH US IN SUPPORT OF THIS LEGISLATION HAVE CONCLUDED THAT MINIMUM EFFICIENCY STANDARDS WILL RESULT IN SAVING SIGNIFICANT AMOUNTS OF ENERGY BY PREVENTING THE SALE OF LESS EFFICIENT PRODUCTS. THE INDUSTRY CAN NEITHER CONFIRM NOR DISPUTE THAT CONCLUSION. WE ARE NOT ABLE TO ESTIMATE THE MAGNITUDE OF THE SAVINGS WHICH MIGHT RESULT. IT'S DIFFICULT TO PROJECT FOR COMPARATIVE PURPOSES THE AVERAGE EFFICIENCIES OF ALL PRODUCTS WHICH WOULD BE SOLD BOTH WITH AND WITHOUT FEDERAL STANDARDS. EFFICIENCIES WILL CONTINUE TO IMPROVE IN EITHER CASE.

ARE THE STANDARDS IN THE BILL STRINGENT WITH RESPECT TO CENTRAL AIR CONDITIONERS AND HEAT PUMPS? THE ANSWER IS EMPHATICALLY YES. THE BILL IMPOSES A STANDARD OF 10.0 SEASONAL ENERGY EFFICIENCY RATIO (SEER) FOR SPLIT SYSTEMS MANUFACTURED ON OR AFTER JANUARY 1, 1992, AND 9.7 SEER FOR SINGLE PACKAGE SYSTEMS MANUFACTURED ON OR AFTER JANUARY 1, 1993. IN COMPARISON, THESE STANDARDS ARE MUCH HIGHER THAN THE 1984 NATIONAL CONSENSUS STANDARD OF 7.8 ENERGY EFFICIENCY RATIO ADOPTED BY THE AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR-CONDITIONING ENGINEERS (ASHRAE), AND THEY ARE SIGNIFICANTLY HIGHER THAN LEVELS BEING PROPOSED BY ASHRAE FOR 1992. NEW YORK HAS ENACTED STANDARDS OF 8.5 SEER FOR CENTRAL AIR CONDITIONING HEAT PUMPS AND 9.5 SEER FOR

CENTRAL AIR CONDITIONERS. THE CALIFORNIA ENERGY COMMISSION HAS PRESCRIBED A STANDARD OF 9.9 SEER THAT WILL GO INTO EFFECT IN 1993 FOR CENTRAL AIR CONDITIONERS AND HEAT PUMPS. THE STANDARD IS THE BILL FOR SPLIT SYSTEMS IS HIGHER THAN ANY STANDARD CURRENTLY IN EFFECT OR PROPOSED.

IN ARRIVING AT AN AGREEMENT ON THE DETAILS OF THIS LEGISLATION INDUSTRY HAS MADE A NUMBER OF CONCESSIONS. FROM INDUSTRY'S VIEWPOINT THE REQUIREMENTS GOVERNING STATE STANDARDS ARE NOT AS STRONG, THE PROVISIONS FOR STATE BUILDING CODES ARE MORE LIBERAL, AND THE PERIOD OF DURATION OF THE STANDARDS IS LESS THAN OUR ORIGINAL OBJECTIVES. THE STANDARDS IN MANY CASES ARE MORE DEMANDING THAN WE HAD INITIALLY BEEN PREPARED TO ACCEPT. HOWEVER, THE MANUFACTURERS IN OUR ASSOCIATION DIRECTLY AFFECTED BY THIS LEGISLATION HAVE EXAMINED IT AND HAVE VOTED UNANIMOUSLY THAT THEY CAN ACCEPT IT. ALTHOUGH THE PRICE IS STEEP, THEY ARE PREPARED TO PAY IT IN ORDER TO ASSURE A FREE AND EFFICIENT NATIONAL MARKET PLACE.

I CANNOT STRESS TOO STRONGLY THE IMPORTANCE OF THE PROVISIONS IN THE BILL FOR STATES TO MEET EXPLICIT CRITERIA TO BE AUTHORIZED EXEMPTION FROM FEDERAL STANDARDS. ANY WEAKENING OF THESE PROVISIONS WILL UNRAVEL THE DELICATE CONSENSUS WHICH NOW EXISTS WITHIN THE INDUSTRY CONCERNING THESE PROPOSED STANDARDS. I BELIEVE ALL STATES WILL SOON CONCLUDE THAT THESE FEDERAL STANDARDS WILL SATISFY THEIR ENERGY CONSERVATION NEEDS AND OFFER MANY ADVANTAGES IN COMPARISON WITH THE CURRENT SITUATION. CONSUMERS WILL BENEFIT BY HAVING AVAILABLE THE WIDEST CHOICE OF EFFICIENT PRODUCTS AT THE LOWEST POSSIBLE COST. TAXPAYERS WILL BENEFIT BY AVOIDING THE COSTS OF ADMINISTERING AND ENFORCING STATE STANDARDS.

IN SUMMARY, THE AIR CONDITIONING INDUSTRY STRONGLY URGES THE EARLY ENACTMENT OF THIS LEGISLATION AS IT STANDS. ONCE ENACTED, OUR COMPANIES CAN BEGIN THE DIFFICULT TASK OF PREPARING TO MEET THESE STANDARDS.

THANK YOU.

Senator EVANS. Thank you very much.

I should have announced before we began that all of the prepared statements will be included in their entirety in the record, and you are free to summarize in whatever way you choose during your oral testimony.

With that, Mr. Dowd.

STATEMENT OF CHARLES A. DOWD, PRESIDENT, ADMIRAL CO., A DIVISION OF MAYTAG, CORP., ON BEHALF OF THE ASSOCIATION OF HOME APPLIANCE MANUFACTURERS

Mr. DOWD. Thank you, Mr. Chairman. Good morning Mr. Hecht and members of the subcommittee.

I am Chuck Dowd, president of Admiral Co., a division of Maytag Corp. Admiral manufactures refrigerators and freezers, among other appliances. I represent the Association of Home Appliance Manufacturers, or AHAM, in appearing today. I serve as chairman of AHAM's Refrigerator-Freezer Executive Board.

S. 2781 proposes Federal regulation but in fact provides for regulatory simplification. The bill should be viewed in that light. The bill will also reduce energy consumption by home appliances, yet retain product choice for appliance consumers.

AHAM urges the subcommittee to consider these facts. Energy efficiency regulations already exist in a number of States and are proposed or under development in a number of others. The appliance industry has come to realize, albeit reluctantly, that it must come to terms with some form of regulation. Responding to regulations on the Federal level offers a coherent approach.

Our industry manufactures for a national market. Attempting to address a myriad of standards undermines the basic strength of our manufacturing and distribution system and cripples our ability to provide overall value to U.S. consumers. Also, paradoxically, the Federal Regulatory Program established in S. 2781 has the effect of deregulating the U.S. marketplace by replacing a multitude of regulations with a single system.

Furthermore, preserving the national marketplace through enactment of the National Appliance Energy Conservation Act is in keeping with the open market philosophy of the administration for international trade policy. Opposition to the bill creates an inconsistency. Opposition, in effect, would foster a fragmented U.S. market consisting of individual conflicting State requirements, setting up a system, as it were, of nontariff barriers that flies in the face of our policy in the world market.

Since the United States plainly opposes such a system in the international market, we submit that the same philosophy must be applied to our national market. Free trade will ultimately strengthen the United States in international competition.

Let me describe for a moment how our marketplace works. Some major home appliance manufacturers use the two-step method of distribution in marketing their products: first, from manufacturer to wholesale distributor; and second, from the wholesale distributor to the retailer or the builder-developer. Other manufacturers may sell directly to retail dealers, builder-developers or buying groups, completely bypassing wholesalers. Private brand retailers may buy directly from manufacturers.

Doing business under this physical distribution scheme is challenging in the national market. It is also, though, very efficient. A marketplace where different States require certain models of appliances and prohibit the sale of others would be a nightmare. What is more, it would, of necessity, add to a manufacturer's cost of doing business and therefore undermine the overall product value we seek to preserve.

With a national market, appliance manufacturers can realize economies of scale and are able to share those economies with their customers, economies not just of production but of distribution, too.

The record shows that the highly competitive appliance industry has year after year gained greater efficiencies of both production and distribution. The result has been value to the consumer.

Gentleman, at this point I would depart from written remarks to relate a vivid example of how our American appliance industry has stacked up in this all-important measure of value. If you will indulge me, I would like to share with you an actual display of something that I came across recently. It was a yellowed copy of the Akron, OH, newspaper dated July 1953. I have taken the liberty of taking a couple of ads out of that newspaper. I would like to share them with you today.

First, you see here under the banner headline "Like Christmas in July," an ad for a brand new Buick automobile, $2,275. Now, if that does not cause nostalgia in all of us, I do not know what will. In the same newspaper, we see a refrigerator, in this case a Kelvinator refrigerator, 11.5 cubic feet, for $299.95. Now, it is not a refrigerator most of us would have in our home today because you would have to defrost it. Back in those days, you did it manually. Today it is automatic defrost, and it is smaller than most of the appliances that we buy today in today's market. It was, however, $299.95.

Now, I happened to get the same Akron, OH, newspaper 30 years hence in 1983. Let us take a look at what happened by then. Here is a Buick automobile again; in this case, now $9,983. Remember the first price, $2,275. You know what, I would like to buy one today for $9,983. In the same newspaper, we have a refrigerator, in this case a Kenmore, in this case 18 cubic foot, automatic defrost with a host of additional features for $499.95.

So you can see the kind of value, gentlemen, that I am talking about, and it has occurred right here in our home market due to the greatest exercise possible of the free enterprise system.

My point is this. This legislation prevents the disruption of the efficient national marketplace for which we manufacture and distribute and which has provided the American consumer with this kind of home appliance product at the least cost possible.

A mortal threat, though, to this efficient national marketplace is posed by two colliding events: No. 1, the Circuit Court of Appeals ruling in *NRDC* v. *Herrington,* which overturned DOE's no standard standards for most of the major appliances we manufacture; and No. 2, the consideration by as many as 18 states of differing standards for those products. Four States presently have different State standards in place. We are faced, therefore, with the probability of both strict Federal energy efficiency standards and a crazy quilt of differing State standards.

The debate over appliance energy efficiency never argued whether appliance efficiency should improve but rather by what means, free market forces alone or mandatory standards. The appliance industry began designing for energy efficiency in the early 1970's. Those improvements were accomplished without sacrificing other important product characteristics, because the industry had the flexibility to plan design advancements when they best fit the company manufacturing process and because the industry could produce for a national market.

This bill gives us the chance to do what we can do best: Give the American consumer quality appliances at the least possible cost.

In closing, gentlemen, I urge the subcommittee to treat this issue with a sense of real urgency. The appliance industry will be investing hundreds of millions of dollars in new tooling for a whole range of efficient appliances into the future. Let us provide the guidance necessary for that investment to go forward now rather than to perpetuate uncertainty that will frustrate and delay that stimulant to our industry and to the economy in general.

Mr. Chairman, I would also like to submit for the record a letter from my chairman of Maytag Corp., Mr. Dan Krumm, to the Honorable Mr. Herrington in support of the bill, and I thank the committee for listening.

Senator EVANS. We thank you, and that letter will be introduced into the record.

[The prepared statement of Mr. Dowd and letter submitted follow:]

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STATEMENT BY

CHARLES A. DOWD
PRESIDENT, ADMIRAL COMPANY, A DIVISION OF MAYTAG, CORP.

ON BEHALF OF

THE ASSOCIATION OF HOME APPLIANCE MANUFACTURERS

BEFORE THE

SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION
OF THE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

SEPTEMBER 16, 1986

Statement by
Charles A. Dowd
President, Admiral Company, a division of Maytag Corp.
on behalf of the
ASSOCIATION OF HOME APPLIANCE MANUFACTURERS
to the
SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
REGARDING S. 2781

I. Introduction

I am Chuck Dowd, President of Admiral Company, a division of Maytag Corporation. Admiral is a manufacturer and marketer of refrigerators, refrigerator-freezers and freezers. I represent the Association of Home Appliance Manufacturers - AHAM - in appearing today before the Subcommittee on Energy Regulation and Conservation of the Senate Committee on Energy and Commerce. I serve as Chairman of AHAM's Refrigerator-Freezer Executive Board.

AHAM is an international trade association which speaks on behalf of its member companies. The positions I report to you today are on behalf of those members, which produce a preponderance of the home appliances sold in the United States. Companies in AHAM's Major Appliance Division are shown in Attachment 1 filed with the official copy of this statement. AHAM's product scope includes the following appliances named in existing federal energy legislation: refrigerators, refrigerator-freezers, room air conditioners; dishwashers; clothes washers and dryers; kitchen ranges and ovens; dehumidifiers and humidifiers.

My purpose is to provide a concise but comprehensive recap and update on the often-controversial subject of appliance energy efficiency and energy consumption - and to support a reasonable, timely approach to address this much-debated issue.

In presenting these comments, AHAM urgently seeks the support of individual Subcommittee members, as well as the Subcommittee as a body, for legislation entitled The National Appliance Energy Conservation Act (NAECA) of 1986. This proposed legislation, introduced in the Senate on August 15, represents a carefully deliberated, painstakingly negotiated compromise solution to a long-standing and difficult controversy. The participants most immediately involved in the process were those most knowledgeable about the issues: appliance manufacturers and marketers and energy conservation advocates.

The proposed NAECA amendments to the Energy Policy and Conservation Act (EPCA) would establish mandatory national standards for appliance energy use. Enactment of the bill will reduce energy consumption by home appliances, yet retain product choices for appliance consumers.

II. History

The Arab oil embargo of 1973 directed critical attention to energy use in the United States, and resulted in development of a national energy policy.

Congress targeted for analysis the energy used by home appliances in the residential sector in passing the Energy Policy and Conservation Act (EPCA) of 1975.

The law replaced voluntary appliance energy labeling programs already under way in cooperation with the Department of Commerce (DOC) and provided for voluntary appliance energy efficiency improvement targets seeking 20% overall reduction in energy consumed by appliances. Ninety percent of our industry committed to the voluntary programs at the time.

Under EPCA, the appliance industry participated intensely in development of programs required by Congress, including establishment of test procedures for various appliances and the EnergyGuide labeling program. When the National Energy Conservation Policy Act (1978) mandated analysis of energy efficiency standards in lieu of voluntary targets, the appliance industry participated again, responding to proposals and providing confidential industry data.

Simultaneous to the government's activity in the energy area, the nation and the industry felt another impact of the energy crisis: a dramatic increase in energy prices which increased consumer awareness of appliance energy efficiency. In response, the highly competitive appliance industry immediately sought more energy-efficient designs. In fact, by the time NECPA passed in 1978, an efficiency improvement record had already been established when appliance models were compared with 1972 equivalents. The industry continues to view energy efficiency as a priority product planning consideration. For example, as of 1984, refrigerator-freezer efficiency improved by 71.1%, freezers improved by 59.1%, and room air conditioners improved by 25.1%. Detail on the continuing improvement record for products represented in AHAM is shown in Attachment 2 of our official filing.

While improving appliance energy efficiency and thus lowering energy consumed by appliances in the residential sector, AHAM's members have maintained or improved product safety, reliability, performance and product features popular with appliance buyers. Morever, this was accomplished with appliance prices rising more slowly than others in the Consumer Price Index. Since 1965, the CPI for all items rose 222.2%; household appliances rose only 84%. Detail on the appliance industry's favorable record in this area, when compared with other products is shown in Attachment 3.

These efficiency improvements occured in a virtually unregulated market. They were accomplished without sacrificing other important product characteristics, and without exorbitant price increases, because the industry could produce for a national market and had the flexibility to plan design advancements when they best fit the company manufacturing process. However, both the national market and reasonable manufacturing lead times are currently threatened. So the appliance industry has joined with former adversaries in this area to support S. 2781 and the federal standards it contains.

We still hold that regulations are not needed to drive efficiency improvements. But practicality demands that we abandon our staunch opposition to regulations to preserve the national market and our competitiveness with other consumer products industries for the consumer dollar. To survive, the home appliance industry must be able to continue manufacturing products that consumers want, at prices they are willing to pay.

III. The Benefits of S. 2781

General Discussion

The debate over appliance energy efficiency never argued whether appliance efficiency should improve, but rather what means -- free market forces alone or mandatory standards -- would adequately drive that improvement. Negotiations resulting in S. 2781 involved groups with diverse and strongly-held philosophical positions on this fundamental issue. The bill's strength lies in the very roots of the negotiation process: each party to the compromise balanced its needs with the needs of other parties to the discussion. Each group conceded some, benefited some.

The resulting highlight strengths of S. 2781 are:

- It establishes specific future energy conservation standards for most major home appliances and central heating and cooling systems;
- It supersedes further state regulation of appliance efficiency but allows petition for exemption after a set period and recognizes the exigencies of emergency situations;

- It establishes predictability on future energy demand for utilities and state energy commissions;
- It preserves existing state building codes affecting appliances;
- It retains the national EnergyGuide labeling program;
- It gives manufacturers adequate lead time to develop new energy efficient appliances to meet the standards; and
- It establishes timetables and criteria for the Department of Energy to reevaluate and, if appropriate, revise the standards.

AHAM believes that, with these provisions, the bill enhances the original congressional mandate "to increase domestic energy supplies and availability; to restrain energy demand; to prepare for energy emergencies..." (P.L.94-163). More importantly, enactment of the bill may assure more expeditious and orderly advancement toward these objectives.

Important Benefits to Appliance Manufacturers

As indicated earlier in these comments, certain of the bill's provisions are most critically important to the home appliance industry as represented in AHAM. Strong, preemptive Federal standards benefit appliance manufacturers and the consumers it serves because they:

- provide a more reasonable planning time frame, and
- preserve the national market upon which manufacturers depend.

Reasonable lead times are important to more cost-effective product planning. Incorporating a product change to an existing model is often equivalent to introducing a totally new product -- each of the steps in the complex, highly intergrated manufacturing process must be taken, and each of those steps takes time and requires expenditure of capital. By providing adequate time before the implementation of energy conservation standards, the bill allows manufacturers to both accomplish and fund the job of designing, testing and retooling, and still retain product value for U.S. consumers.

A national market is similarly critical to maintaining product value. With a national market, appliance manufacturers can realize economies of scale and are able to share those economies with their customers. The benefit of a national market extends beyond the cost-effectiveness of mass production and into the post-manufacturing area of distribution.

Major home appliance manufacturers typically use the "two-step" method of distribution in marketing their products -- first, from manufacturer to wholesale distributor and, second, from the wholesale distributor to the retailer or the builder/developer. There are exceptions, however, to this "two-step" method. Manufacturers may sell directly to retail dealers, builders/developers or buying groups, completely bypassing wholesalers. Private brand retailers buy directly from manufacturers. Mass merchandisers, who usually buy directly from manufacturers, sometimes receive sales and merchandising support at the local level from the wholesale distributors of manufacturers whose lines they handle.

This variety of business relationships operating within the appliance industry as represented in AHAM impacts on the physical distribution of appliances. In a national market, inventories of finished products are generally maintained at factory warehouses, regional warehouses under the manufacturer's direct control and at the wholesale distributor level. Private brand retailers and mass merchandisers maintain inventory at points strategically located to serve their retail outlets. Manufacturers may ship products from the factory in a variety of ways:

to a regional warehouse, then to a wholesale distributor and then to a builder/developer;

to the retailer;

to a wholesale distributor and then to a retailer; or

to a regional warehouse and then to a retailer.

Attachment 4 to the filed copy of these comments provides a flow chart depicting the various combinations of parties in the physical distribution of appliances.

Doing business under this physical distribution scheme is challenging in a national market. A marketplace where different states allow certain models of appliances and prohibit the sale of others would be a nightmare. What's more, it would of necessity add to a manufacturer's cost of doing business and therefore undermine the overall product value we seek to preserve.

Despite the appliance industry's apparent philosophical acquiescence regarding need for mandatory standards, there is continuity in our position. That continuity evolves from our industry's high commitment to energy conservation. That commitment originated during a period of crisis and energy shortages in the 1970s -- and has continued beyond a period of energy excess. We have dramatically improved our product efficiencies. In supporting this bill, we further demonstrate our continuing commitment.

Business practicality has caused AHAM's members to reevaluate its traditional means to that end. We strongly support S. 2781 and the mandatory standards it contains because it offers the best chance for preserving a national market unprecedented in the world. Even an industry that philosophically opposes federal regulations must reevaluate its position when it sees the national market being destroyed by a patchwork of different state standards. In supporting federal standards at this time AHAM is using the federal government to govern appropriately, we believe.

IV. Specific Provisions of the Bill

General Comment

In providing detail and rationale for specific sections proposed in S. 2781 AHAM comments only on sections that are either of general importance or specifically related to products manufactured by its members (see product scope listed on page 1). Issues or changes related to other product areas are not discussed here.

In offering explanation for changes proposed in S. 2781, AHAM submits that some modification to the procedural detail structured in 1978 is surely justified. The amendments we support today are the result of additional experience in appliance energy conservation. Moreover, the plan we now ask the Committee to support brings to bear the studied input of individuals and organizations, including those most knowledgeable and experienced in appliance design and marketing.

Section 2. Definitions

The bill changes the term "energy efficiency standard" to "energy conservation standard" and broadens the definition of the term.

Changing the term recognizes that there are other ways of stating energy conservation than as efficiency improvement, per se. Broadening the definition to allow such other measures to be a standard more realistically accommodates the market and accomplishes the same end.

Thus, energy conservation standards may include either: a minimum level of energy efficiency; a maximum quantity of energy use (consumption); or for specified products, naming of a design requirement that results in improved efficiency and reduced consumption.

Section 3 Product Scope

The appliances in AHAM's product scope that are included in S. 2781 are:

Section 3. Product Scope

The appliances in AHAM's product scope for which initial standards are provided in S. 2781 are:

Refrigerators, refrigerator-freezers and freezers
Room air conditioners
Dishwashers
Clothes washers
Clothes dryers
Kitchen ranges and ovens

For refrigerators and freezers, products with designs not applicable for general consumer use are excluded. For example, models without doors are intended for commercial use and are excluded by definition. Freezers with 30 cubic foot capacity and refrigerators with greater than 39 cubic foot refrigerated volume are designed for specialty use, have low volume sales, and are excluded in the conservation standards.

Section 4. Test Procedures

The validity of any appliance energy programs rests in meaningful test procedures to measure energy consumption. The EnergyGuide labeling program administered by the Federal Trade Commission and energy disclosures in advertising remain in the law and depend fundamentally on the existence and integrity of test procedures.

S. 2781 offers amendments that preserve, for continuity, existing test procedures but also clarify the process by which existing procedures may be updated or new procedures may be added. These procedures have high value to the appliance industry and to the program in general.

Section 5. Federal Energy Conservation Standards

In addition to setting standards for various appliances, the energy conservation standards section of S. 2781 establishes various timetables for implementation of standards by product. The timetables, as well as the standards themselves, were integral to the negotiation process and are of fundamental importance to AHAM's members. They enable manufacturers to deploy investments optimally for the well-being of their employees and stockholders. Moreover, the section provides for both review of the standards after set periods, and establishes criteria for determining whether a particular standard merits reconsideration or strengthening.

AHAM has estimated that for the period 1990-1995, the total energy savings at point of generation accomplished through refrigerator, freezer and room air conditioner standards alone represents 206,000 gWh.

AHAM believes the standards for its products that achieve this savings are commercially attainable on a national level, yet tough. To demonstrate that point, AHAM compared 1986 models for several product categories against the efficiency required by standards. We found that 80% of refrigerators, 80% of freezers and 62% of room air conditioners do not meet the standard proposed, and will have to be modified if they are to be sold after the effective date of the respective standards. Clearly, manufacturers will be making an even greater investment in conservation. We have been long committed to that goal and to retaining popular consumer features. We formalize our commitment through support of this bill in order to preserve the national market. It's simply that important to us.

Section 6. Certification and Enforcement

The certification and enforcement requirements of the act are reasonable and adequate. They insure that necessary checks and balances occur but discourage cumbersome, costly and excessive federal regulatory procedures.

Section 7. Supersession

It is the prospect of national standards, rather than the disrupting and costly alternative of addressing numerous state standards that brought the appliance industry to the bargaining table.

We have supported federal standards over the state standards consistently in the past, starting as early as 1977. Our reasoning remains in tact and it follows.

Our industry cannot serve more than one master efficiently, and if Congress does not recognize this hard fact right now, no cognizant government authority ever will. The result will be chaos -- a jumble of conflicting "non-tariff barriers" around the respective states, each state competing against the other to see which can "protect" its citizens better. Our national industry as we know it today would be radically reshaped -- surely less efficient, surely higher priced. The U.S. citizens, your constituents in those states, would pay the price in buying their appliances. This industry's position of supporting federal minimum standards again today is strongly based on having it carry with it strong, clean-cut, readily administerable preemption by federal law.

As in the past, however, we recognize that emergency, truly special circumstances may exist or may occur in the future. The amendments provide for strong preemption, but also provide for states to seek exemption from preemption in such circumstances. We simply believe that such exceptions must, for equity's sake, be limited to emergencies or truly unique needs. The amendments before you provide for that equity, in both this industry's assessment and in that of our our former adversaries.

V. Conclusion

AHAM asks that the Subcommittee on Energy Regulation and Conservation of the Senate Committee on Energy and Natural Resources act in the national interest and in the interests of its constituents by promptly passing S. 2781 out of Subcommittee and forcefully supporting it in the full Senate. In so doing, you will recognize a unique and sound approach to energy conservation.

ATTACHMENT 1

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MAJOR APPLIANCE DIVISION MEMBERS

- AB Electrolux of Sweden
  - Tappan Company
    - O'Keefe & Merritt Company
  - White Consolidated Industries
    - WCI Appliance Group
    - Athens Stove Works
    - Belding Products Company
    - Columbus Products Company
    - Edison Products Company
    - Franklin Manufacturing Company
    - Frigidaire International
    - Gibson International
    - GR Manufacturing Company
    - Greenville Products Company
    - Kelvinator Commercial Products
    - Kelvinator International
    - Mansfield Products Company
    - Philco International Company
    - Webster City Products Company
    - White-Westinghouse International
- Addison Products Company
- Broan Manufacturing Company
- Carrier Corporation
- Daikin U.S. Corporation*
- Design & Manufacturing Corporation
  - Absocold Corporation
- Ebco Manufacturing Company
- Emerson Electric, In-Sink-Erator Div.
- Emerson Quiet Kool Company
- Fedders Corporation
  - Fedders Air Conditioning-USA
- Friedrich Air Conditioning & Refrigeration Company
- General Electric Company
- General Freezer Limited*
- KeepRite, Inc.*
- Martin Industries
- Matsushita Electric Industrial Company, Ltd.
  - Home Appliance Group-Panasonic Co.
  - Matsushita Services Company
  - Matsushita Industrial Company
  - Quasar Company
- Maytag Corporation
  - Admiral Company
    - Norge Operation
    - Warwick Manufacturing Corp.
  - Magic Chef Company
  - Maytag Company
    - Hardwick Stove Company
    - Jenn-Air Company
- Northland Company
  - Northland Refrigeration Division
- Raytheon Company
  - Amana Refrigeration, Inc.
  - Caloric Corporation
    - Glenwood Range
    - Modern Maid Company
  - Speed Queen Company
- Riccar America Company*
- Roper Corporation
- Sanyo Electric Inc.
  - Sanyo E&E Corporation
- Sub-Zero Freezer Company
- Toshiba America, Inc.
- Whirlpool Corporation
  - Heil-Quaker Corporation
  - KitchenAid Division
- W. C. Wood Company Limited*

*International Member

ATTACHMENT 2

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS
20 NORTH WACKER DRIVE • CHICAGO, ILLINOIS 60606
312 984 5800
GOVERNMENT RELATIONS: 1901 L STREET, N. W.
WASHINGTON, D. C. 20036; 202 466-3350

REFRIGERATORS

ENERGY EFFICIENCY AND CONSUMPTION TRENDS*

	Adjusted Volume/Unit*		Energy Consumption/Unit*		Efficiency	
	Cu. Ft.	% Change vs. 1972	kWh/Yr.	% Change vs. 1972	Energy Factor	% Change vs. 1972
1972	18.16	--	1726.45	--	3.84	--
1978	19.73	+8.6%	1452.70	-15.9%	4.96	+29.0%
1980	19.60	+7.9	1277.50	-26.0	5.59	+45.6
1981	19.86	+9.4	1189.54	-31.1	6.09	+58.6
1982	19.97	+10.0	1190.70	-31.0	6.12	+59.4
1983	20.31	+11.8	1160.21	-32.8	6.39	+66.4
1984	20.51	+12.9	1138.80	-34.0	6.57	+71.1

*Shipment Weighted Averages

7/19/85

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS
20 NORTH WACKER DRIVE • CHICAGO, ILLINOIS 60606
312 984 5800
GOVERNMENT RELATIONS: 1901 L STREET, N. W.
WASHINGTON, D. C. 20036; 202 466 3350

FREEZERS

ENERGY EFFICIENCY AND CONSUMPTION TRENDS*

	Adjusted Volume/Unit*		Energy Consumption/Unit*		Efficiency*	
	Cu. Ft.	% Change vs. 1972	kWh/Yr.	% Change vs. 1972	Energy Factor	% Change vs. 1972
1972	29.18	-	1460.00	-	7.29	-
1978	26.84	- 8.0%	985.50	-32.5%	9.92	+36.1%
1980	26.26	-10.0%	883.30	-39.5%	10.85	+48.8%
1981	25.53	-12.5%	837.14	-42.7%	11.13	+52.7%
1982	25.11	-13.9%	812.85	-44.3%	11.28	+54.7%
1983	25.32	-13.2%	813.33	-44.3%	11.36	+55.8%
1984	25.40	-13.0	799.35	-45.3	11.60	+59.1%

*Shipment Weighted Averages

7/19/85

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS
20 NORTH WACKER DRIVE • CHICAGO, ILLINOIS 60606
312-984-5800
GOVERNMENT RELATIONS: 1901 L STREET, N. W.
WASHINGTON, D. C. 20036; 202-466-3350

ROOM AIR CONDITIONERS

ENERGY EFFICIENCY AND CONSUMPTION TRENDS*

	Capacity/Unit		Energy Consumption/Unit		Efficiency	
	Btu/Hr	% Change vs. 1972	kWh/Yr**	% Change vs. 1972	E.E.R.	% Change vs. 1972
1972	10,226.8	-	1,281.8	-	5.98	-
1978	10,827.6	+5.9%	1,209.2	- 5.7%	6.72	+12.2%
1980	10,606.6	+3.7	1,134.2	-11.5	7.02	+17.3
1981	10,924.4	+6.8	1,161.1	- 9.4	7.06	+18.1
1982	10,801.4	+5.6	1,135.0	-11.5	7.14	+19.4
1983	10,566.3	+3.3	1,087.8	-15.1	7.29	+21.9
1984	10,412.8	+1.8	1,044.3	-18.5	7.48	+25.1

* Shipment Weighted Averages
**@ 750 Hours of Operation

ROOM AIR CONDITIONER SHIPMENTS BY

ENERGY EFFICIENCY (EER) CLASSIFICATION

Energy Efficiency Ratio	% of Domestic Unit Shipments							% Change in Share of Total 1984 vs. 1974
	1974	1978	1980	1981	1982	1983	1984	
Under 6.5	52.3	41.8	36.9	34.3	30.8	28.7	25.0	-52.2
6.5 - 7.4	27.8	28.6	20.6	19.5	19.4	20.7	20.0	-28.1
7.5 - 8.4	9.2	18.0	31.1	29.8	31.2	28.2	27.3	+196.7
8.5 & Over	10.7	11.6	11.4	16.4	18.6	22.4	27.7	+158.9
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

7/12/85

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS
20 NORTH WACKER DRIVE • CHICAGO, ILLINOIS 60606
312-984-5800
GOVERNMENT RELATIONS: 1901 L STREET, N. W.
WASHINGTON, D. C. 20036; 202-466-3350

DISHWASHERS

ENERGY EFFICIENCY AND CONSUMPTION TRENDS

	Energy Consumption/Unit*		Efficiency*	
	kWh/Cycle	% Change vs. 1972	Energy Factor	% Change vs. 1972
1972	4.17	--	.24	--
1979	3.23	-22.5%	.31	+29.2%
1981	2.87	-31.2	.35	+45.8
1983	2.70	-35.3	.37	+54.2
1984	2.73	-34.5	.37	+54.2

*Shipment Weighted Averages

5/22/85

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS
20 NORTH WACKER DRIVE • CHICAGO, ILLINOIS 60606
312 984 5800
GOVERNMENT RELATIONS: 1901 L STREET, N. W.
WASHINGTON, D. C. 20036, 202 466-3350

CLOTHES WASHERS

ENERGY EFFICIENCY AND CONSUMPTION TRENDS*

	Tub Volume/Unit		Energy Consumption/Unit		Efficiency	
	Cu. Ft.	% Change vs. 1972	kWh/Cycle	% Change vs. 1972	Energy Factor	% Change vs. 1972
1972	2.44	-	3.81	-	.64	-
1979	2.56	+4.9%	2.80	-26.5%	.91	+42.2%
1981	2.52	+3.3	2.59	-32.0	.97	+51.6
1983	2.54	+4.1	2.57	-32.5	.99	+54.7
1984	2.51	+2.9	2.54	-33.8	.99	+54.7

*Shipment Weighted Averages

7/12/85

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS
20 NORTH WACKER DRIVE • CHICAGO, ILLINOIS 60606
312-984-5800
FEDERAL RELATIONS: 1901 L STREET, N. W.
WASHINGTON, D. C. 20036; 202-466-3350

CLOTHES DRYERS

ENERGY EFFICIENCY AND CONSUMPTION TRENDS*

Electric Dryers

	Output/Unit		Energy Consumption/Unit		Efficiency	
	Lb. Clothes	% Change vs. 1972	kWh/Cycle	% Change vs. 1972	Energy Factor	% Change vs. 1972
1972	6.73	-	2.58	-	2.61	-
1980	6.75	+.3%	2.51	-2.7%	2.69	+3.1%

Gas Dryers

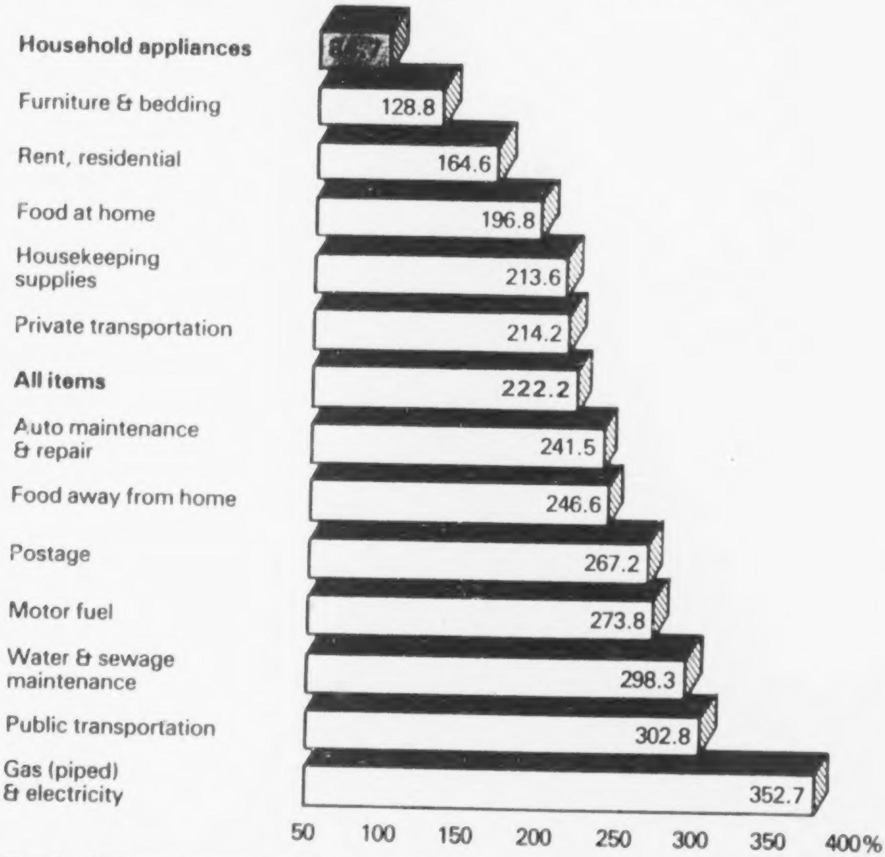
	Output/Unit		Energy Consumption/Unit		Efficiency	
	Lb. Clothes	% Change vs. 1972	10^3 BTU/Cycle	% Change vs. 1972	Energy Factor	% Change vs. 1972
1972	6.97	-	11.84	-	2.01	-
1980	7.00	+.4%	9.91	-16.3%	2.41	+19.9%

*Shipment Weighted Averages

7/27/82 cy

ATTACHMENT 3

Percentage Increases in the Consumer Price Index*
(1985 Averages Compared to 1967)

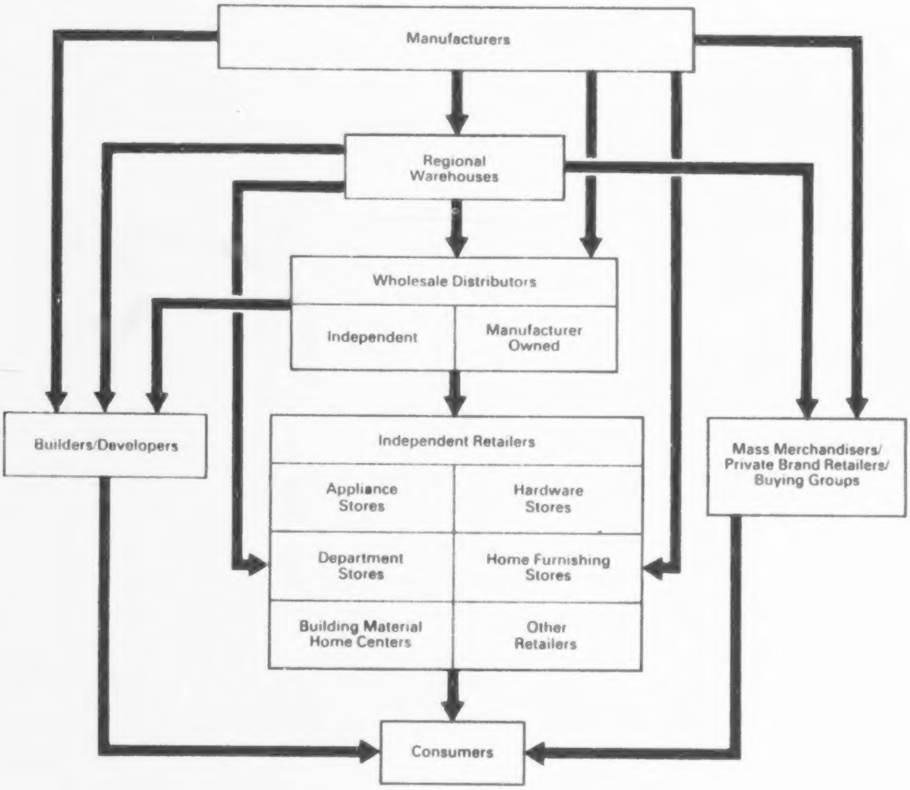


*Based on 1985 annual average Consumer Price Index for all urban consumers.

The "Percentage Increase in the Consumer Price Index" table compares the rate of price increases from 1967 through 1985 for appliances and other expenditures. The percentage increases are based on the 1985 annual average CPI for all urban consumers.

ATTACHMENT 4

MAJOR HOME APPLIANCE PHYSICAL DISTRIBUTION


Manufacturers
Regional Warehouses
Wholesale Distributors
Independent
Manufacturer Owned
Builders/Developers
Independent Retailers
Appliance Stores
Hardware Stores
Department Stores
Home Furnishing Stores
Building Material Home Centers
Other Retailers
Mass Merchandisers/ Private Brand Retailers/ Buying Groups
Consumers

MAYTAG

September 15, 1986

Honorable John S. Herrington
Secretary, U. S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20545

Dear Secretary Herrington:

The Maytag Company, a leading manufacturer of a broad line of home appliances (including such well known brand names as Maytag, Jenn-Air, Hardwick, Magic Chef, Admiral, Norge and Toastmaster) urges you to support passage of pending legislation that would prescribe national energy efficiency standards for appliances.

While we are in agreement with the Administration's policy of non-interference in traditional state regulatory matters, we believe that it clearly is not in the national interest for individual states to impose energy efficiency standards upon appliance manufacturers. The extension and proliferation of such state standards will create chaotic conditions in the national marketplace. In effect, manufacturers will have to design their products to meet the most irresponsible state standards. We believe that this is no longer an issue of states' rights but has become a national issue that must be addressed to ultimately protect consumer interests.

This fact, coupled with the U.S. Court of Appeals decision on DOE's "no standards" rule, compels Maytag to seek federal presence only as a last resort. We believe that the federal standards embodied in the proposed legislation are a reasonable solution to a critical national problem.

Sincerely,

D. J. Krumm
Chairman & C.E.O.

DJK/lb

Senator EVANS. Mr. Bauer.

STATEMENT OF ROBERT J. BAUER, PRESIDENT AND CHIEF EXECUTIVE OFFICER, EMPIRE COMFORT SYSTEMS, INC., ON BEHALF OF THE GAS APPLIANCE MANUFACTURERS ASSOCIATION

Mr. BAUER. Good morning, Mr. Evans, Mr. Hecht. My name is Robert Bauer, president and chief executive officer of Empire Comfort Systems, Inc. Empire is a manufacturer of gas room heaters, floor and wall furnaces, and unit heaters.

I am here today in my capacity as chairman of the board of directors of the Gas Appliance Manufacturers Association, better known by its acronym, GAMA. GAMA is a national trade association representing over 90 percent of the manufacturers of gas-fired residential appliances and equipment, oil and electric water heaters, and oil furnaces.

Most of the manufacturers in this industry strongly feel that minimum efficiency standards are unnecessary in order to achieve the highly desired objective of conserving energy in the home. It is a commonly held belief of manufacturers that consumers will make the appropriate buying decision necessary to cut energy consumption so they can save on their utility bills. There is now substantial evidence to support that view.

Shipment weighted averages of efficiency levels of every product covered under the act show clearly that consumers are buying products with higher and higher efficiencies. For example, the average efficiency of gas furnaces sold nationwide in 1985 was nearly 20 percent higher than that of gas furnaces sold in 1975, but the question now is not whether we should have appliance efficiency regulation. That bridge was crossed in 1975 with the passage of the Energy Policy and Conservation Act, and that policy was reaffirmed and strengthened by Congress 3 years later when EPCA was amended by the National Energy Conservation Policy Act.

Now, 10 years later, manufacturers are still uncertain of the specific requirements to be promulgated under the act or when such requirements will have to be met.

This decade has been costly to taxpayers and to industry, whose costs must be passed along either to stockholders or to consumers in the cost of appliances for purchase. The more obvious cost to the industry resulted from the thousands of man-hours and travel expenses of top company executives who participated in rulemaking hearings.

Perhaps more serious and costly has been the loss of valuable research and development for new products. This occurred because industry engineers and laboratories had to be largely dedicated to investigations and testing required of manufacturers in order to comment on hypotheses propounded by consultant contractors to the Department of Energy and other interested parties.

It has been estimated that over 60 percent of the laboratory capacity of furnace manufacturers was dedicated to this purpose over a period of 4 years. That loss of research capability and the benefits of product improvements that could otherwise have been made can never be recovered. Now, over 10 years after the passage of EPCA, manufacturers are faced with additional years of uncertainty over product designs that will be needed to meet unknown standard levels of efficiency.

The problems of manufacturers are not confined to the requirements of Federal rulemaking. Several States have embarked on their own energy conservation programs that include minimum appliance efficiency standards. This patchwork of inconsistent and unpredictable State standards threatens to cause chaos in the marketplace in higher prices for all consumers.

If manufacturers cannot achieve economies of scale that historically have been possible through sales and distribution to a free and unrestricted national market, higher production, and distribution costs will result.

Furthermore, State efficiency regulations, unlike the proposed uniform national standards, create great unpredictability in the marketplace, not just because they are inconsistent but because they are unevenly enforced and subject to change at any time.

As the standards development process of some States rival DOE rulemaking procedures in their demands on the manufacturing community, simultaneous activity of several States with that of the DOE will severely tax the ability of industry to respond.

The intent of Congress when enacting current law was that Federal standards, once developed, would preempt similar State laws, but the preemption criteria in section 327(b) of EPCA is so vague and general and has been so liberally construed by DOE that DOE proposed to grant every one of the 26 State petitions for exemption from its no standard standards.

The likelihood of having both stringent Federal standards and a multitude of differing State standards is extremely disturbing and could have serious cost escalation consequences. Reduced competition and the loss of consumer choice of models and features are also likely to result.

It was with that background that manufacturers reluctantly came to the conclusion that a legislative solution that embodied reasonable Federal standards, adequate time to design and tool to meet effective dates and strong preemption of State law was far more desirable than the situation I have described.

Upon investigation, we found strong support for such an approach among those who have consistently advocated national standards. Upon reflection, the logic of such an approach became even clearer. We had been representing viewpoints in the voluntary standards arena and in State and Federal legislative and regulatory hearings for nearly 15 years. Each recognized the problems and objectives of the other. It was a healthy atmosphere for negotiations, and the efficiency levels agreed upon satisfy the many interests involved, including manufacturers, consumers and environmentalists.

S. 2781 is the result of those extended negotiations. The lengthy list of supporting organizations is testimony to the broad acceptance of the proposed legislation. As a representative of manufacturers of a wide range of appliances and equipment, including the most energy-intensive products covered by the act, I urge this subcommittee to seek prompt approval of the bill by the full committee and the entire Senate.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Bauer follows:]

Gama

1901 North Moore Street · P.O. Box 9245 · Arlington, Virginia 22209 703/525-9565

STATEMENT OF
ROBERT J. BAUER
CHAIRMAN OF THE BOARD
GAS APPLIANCE MANUFACTURERS ASSOCIATION, INC.

BEFORE THE
SENATE SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION

ON THE
NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

SEPTEMBER 16, 1986

An Association of Manufacturers of Appliances and Equipment for Utilization, Distribution and Control of Gas

STATEMENT OF ROBERT J. BAUER, CHAIRMAN, GAS APPLIANCE MANUFACTURERS ASSOCIATION, BEFORE THE SENATE SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION

SEPTEMBER 16, 1986

I AM ROBERT BAUER, PRESIDENT AND CHIEF EXECUTIVE OFFICER OF EMPIRE COMFORT SYSTEMS, INC. EMPIRE IS A SMALL COMPANY LOCATED IN BELLEVILLE, ILLINOIS. WE MANUFACTURE GAS ROOM HEATERS, FLOOR AND WALL FURNACES, AND UNIT HEATERS. I AM HERE TODAY IN MY CAPACITY AS CHAIRMAN OF THE BOARD OF DIRECTORS OF THE GAS APPLIANCE MANUFACTURERS ASSOCIATION, BETTER KNOWN BY ITS ACRONYM GAMA.

GAMA IS A NATIONAL TRADE ASSOCIATION REPRESENTING OVER 90% OF THE MANUFACTURERS OF GAS-FIRED RESIDENTIAL APPLIANCES AND EQUIPMENT AND OIL AND ELECTRIC WATER HEATERS AND OIL FURNACES. MOST OF THE MANUFACTURERS IN THIS INDUSTRY STRONGLY FEEL THAT MINIMUM EFFICIENCY STANDARDS ARE UNNECESSARY IN ORDER TO ACHIEVE THE HIGHLY DESIRED OBJECTIVE OF CONSERVING ENERGY IN THE HOME. IT IS A COMMONLY HELD BELIEF OF MANUFACTURERS THAT CONSUMERS WILL MAKE THE APPROPRIATE BUYING DECISIONS NECESSARY TO CUT ENERGY CONSUMPTION SO THEY CAN SAVE ON THEIR UTILITY BILLS. THERE IS NOW SUBSTANTIAL EVIDENCE TO SUPPORT THAT VIEW.

SHIPMENT WEIGHTED AVERAGES OF EFFICIENCY LEVELS OF EVERY PRODUCT COVERED UNDER THE ACT SHOW CLEARLY THAT CONSUMERS ARE

BUYING PRODUCTS WITH HIGHER AND HIGHER EFFICIENCIES. FOR EXAMPLE, THE AVERAGE EFFICIENCY OF GAS FURNACES SOLD NATIONWIDE IN 1985 WAS NEARLY 20 PERCENT HIGHER THAN THAT OF GAS FURNACES SOLD IN 1975.

BUT THE QUESTION NOW IS NOT WHETHER WE SHOULD HAVE APPLIANCE EFFICIENCY REGULATION. THAT BRIDGE WAS CROSSED IN 1975 WITH THE PASSAGE OF THE ENERGY POLICY AND CONSERVATION ACT AND THAT POLICY WAS REAFFIRMED AND STRENGTHENED BY THE CONGRESS THREE YEARS LATER WHEN EPCA WAS AMENDED BY THE NATIONAL ENERGY CONSERVATION POLICY ACT.

NOW TEN YEARS LATER, MANUFACTURERS ARE STILL UNCERTAIN OF THE SPECIFIC REQUIREMENTS TO BE PROMULGATED UNDER THE ACT OR WHEN SUCH REQUIREMENTS WILL HAVE TO BE MET.

THIS DECADE HAS BEEN COSTLY TO TAXPAYERS AND TO INDUSTRY WHOSE COSTS MUST BE PASSED ALONG EITHER TO STOCKHOLDERS OR TO CONSUMERS IN THE COST OF APPLIANCES PURCHASED. THE MORE OBVIOUS COST TO THE INDUSTRY RESULTED FROM THE THOUSANDS OF MAN HOURS AND TRAVEL EXPENSES OF TOP COMPANY EXECUTIVES WHO PARTICIPATED IN RULE MAKING HEARINGS. BUT PERHAPS MORE SERIOUS AND COSTLY HAS BEEN THE LOSS OF VALUABLE RESEARCH AND DEVELOPMENT FOR NEW PRODUCTS. THIS OCCURRED BECAUSE INDUSTRY ENGINEERS AND LABORATORIES HAD TO BE LARGELY DEDICATED TO INVESTIGATIONS AND TESTING REQUIRED OF MANUFACTURERS IN ORDER

TO COMMENT ON HYPOTHESES PROPOUNDED BY CONSULTANT CONTRACTORS TO THE DEPARTMENT OF ENERGY AND OTHER INTERESTED PARTIES. IT HAS BEEN ESTIMATED THAT OVER 60 PERCENT OF THE LABORATORY CAPACITY OF FURNACE MANUFACTURERS WAS DEDICATED TO THIS PURPOSE OVER A PERIOD OF FOUR YEARS. THAT LOSS OF RESEARCH CAPABILITY AND THE BENEFITS OF PRODUCT IMPROVEMENTS THAT COULD OTHERWISE HAVE BEEN MADE CAN NEVER BE RECOVERED.

NOW, OVER TEN YEARS AFTER THE PASSAGE OF EPCA, MANUFACTURERS ARE FACED WITH ADDITIONAL YEARS OF UNCERTAINTY OVER PRODUCT DESIGNS THAT WILL BE NEEDED TO MEET UNKNOWN STANDARD LEVELS OF EFFICIENCY.

BUT, THE PROBLEMS OF MANUFACTURERS ARE NOT CONFINED TO THE REQUIREMENTS OF FEDERAL RULEMAKING. SEVERAL STATES HAVE EMBARKED ON THEIR OWN ENERGY CONSERVATION PROGRAMS THAT INCLUDE MINIMUM APPLIANCE EFFICIENCY STANDARDS. THIS PATCHWORK OF INCONSISTENT AND UNPREDICTABLE STATE STANDARDS THREATENS TO CAUSE CHAOS IN THE MARKETPLACE AND HIGHER PRICES FOR ALL CONSUMERS.

IF MANUFACTURERS CANNOT ACHIEVE ECONOMIES OF SCALE THAT HISTORICALLY HAVE BEEN POSSIBLE THROUGH SALES AND DISTRIBUTION TO A FREE AND UNRESTRICTED NATIONAL MARKET, HIGHER PRODUCTION AND DISTRIBUTION COSTS WILL RESULT. FURTHERMORE, STATE EFFICIENCY REGULATIONS, UNLIKE THE PROPOSED UNIFORM NATIONAL

STANDARDS, CREATE GREAT UNPREDICTABILITY IN THE MARKETPLACE, NOT JUST BECAUSE THEY ARE INCONSISTENT, BUT BECAUSE THEY ARE UNEVENLY ENFORCED AND SUBJECT TO CHANGE AT ANY TIME.

AND, AS THE STANDARDS DEVELOPMENT PROCESS OF SOME STATES RIVAL DOE RULEMAKING PROCEDURES IN THEIR DEMANDS ON THE MANUFACTURING COMMUNITY, SIMULTANEOUS ACTIVITY OF SEVERAL STATES WITH THAT OF DOE WILL SEVERELY TAX THE ABILITY OF THE INDUSTRY TO RESPOND.

THE INTENT OF CONGRESS WHEN ENACTING CURRENT LAW WAS THAT FEDERAL STANDARDS, ONCE DEVELOPED, WOULD PREEMPT SIMILAR STATE LAWS. BUT, THE PREEMPTION CRITERIA IN SECTION 327(B) OF EPCA IS SO VAGUE AND GENERAL AND HAS BEEN SO LIBERALLY CONSTRUED BY DOE THAT DOE PROPOSED TO GRANT EVERY ONE OF THE 26 STATE PETITIONS FOR EXEMPTION FROM ITS "NO STANDARD" STANDARDS.

THE LIKELIHOOD OF HAVING BOTH STRINGENT FEDERAL STANDARDS AND A MULTITUDE OF DIFFERING STATE STANDARDS IS EXTREMELY DISTURBING AND COULD HAVE SERIOUS COST ESCALATION CONSEQUENCES. REDUCED COMPETITION AND LOSS OF CONSUMER CHOICE OF MODELS AND FEATURES ARE ALSO LIKELY TO RESULT.

IT WAS WITH THAT BACKGROUND THAT MANUFACTURERS RELUCTANTLY CAME TO THE CONCLUSION THAT A LEGISLATIVE SOLUTION THAT EMBODIED REASONABLE FEDERAL STANDARDS, ADEQUATE TIME TO DESIGN

AND TOOL TO MEET EFFECTIVE DATES AND STRONG PREEMPTION OF STATE LAW WAS FAR MORE DESIRABLE THAN THE SITUATION I HAVE DESCRIBED.

UPON INVESTIGATION WE FOUND STRONG SUPPORT FOR SUCH AN APPROACH AMONG THOSE WHO HAVE CONSISTENTLY ADVOCATED NATIONAL STANDARDS. UPON REFLECTION, THE LOGIC OF SUCH AN APPROACH BECAME EVEN CLEARER. WE HAD BEEN REPRESENTING OPPOSING VIEWPOINTS IN THE VOLUNTARY STANDARDS ARENA AND IN STATE AND FEDERAL LEGISLATIVE AND REGULATORY HEARINGS FOR NEARLY FIFTEEN YEARS. EACH RECOGNIZED THE PROBLEMS AND OBJECTIVES OF THE OTHER. IT WAS A HEALTHY ATMOSPHERE FOR NEGOTIATIONS, AND THE EFFICIENCY LEVELS AGREED UPON SATISFIED THE MANY INTERESTS INVOLVED INCLUDING MANUFACTURERS, CONSUMERS AND ENVIRONMENTALISTS.

S 2781 IS THE RESULT OF THOSE EXTENDED NEGOTIATIONS. THE LENGTHY LIST OF SUPPORTING ORGANIZATIONS IS TESTIMONY TO THE BROAD ACCEPTANCE OF THE PROPOSED LEGISLATION.

AS THE REPRESENTATIVE OF MANUFACTURERS OF A WIDE RANGE OF APPLIANCES AND EQUIPMENT, INCLUDING THE MOST ENERGY INTENSIVE PRODUCTS COVERED BY THE ACT, CENTRAL HEATING FURNACES AND WATER HEATERS, I URGE THIS SUBCOMMITTEE TO SEEK PROMPT APPROVAL OF THE BILL BY THE FULL COMMITTEE AND THE ENTIRE SENATE.

Senator EVANS. Thank you very much.
Dr. Goldstein.

STATEMENT OF DR. DAVID B. GOLDSTEIN, SENIOR STAFF SCIENTIST, NATURAL RESOURCES DEFENSE COUNCIL

Dr. GOLDSTEIN. Thank you, Mr. Chairman and Members of the Subcommittee. My name is David Goldstein. I am Senior Staff Scientist of the Natural Resources Defense Council, a national environmental organization with over 62,000 members and contributors.

My testimony today is on behalf of our organization and on behalf of 13 members of the Energy Conservation Coalition, the American Association of Retired Persons, Citizen Labor Energy Coalition, Environmental Action, Environmental Policy Institute, Federation of American Scientists, Fund for Renewable Energy in the Environment, International Institute for Energy Conservation, Jobs in Energy, National Consumers League, Sierra Club, the United Methodist Church, Union of Concerned Scientists, and the U.S. Public Interest Research Group.

Our organization, NRDC, has worked with State, regional, Federal, and private agencies in promoting energy efficiency in appliances and throughout the economy for over 10 years. We have testified before the legislatures and energy agencies of seven States and regional organizations for energy planning.

Today we appear before your subcommittee as part of a coalition that includes the American Appliance Industry, trade associations representing both public and private utilities and their regulators, State government organizations, home builders, and public interest groups to support a remarkable piece of legislation.

The National Appliance Energy Conservation Act is the result of negotiations between NRDC and the American Appliance Trade Associations, organizations that have been on opposite sides of legislative and judicial disputes for over a decade. This compromise legislation resolves the disputes and clears the way for major energy savings that benefit all parties: Consumers, business, and the environment.

This legislation exemplifies how environmental protection can go hand in hand with economic growth, the creation of new jobs and consumer protection.

Mr. Geller will discuss the direct economic savings from the interim standards in this legislation. They are quite large. These cost savings are accompanied by substantial reductions in air pollution, including the main pollutant precursors to acid rain.

Utilities are a major beneficiary of this bill. The standards in the legislation allow utilities prudently to predict energy savings from appliances and to reduce powerplant construction needs accordingly. This helps utilities in two ways. It reduces investment requirements and helps keep rates lower than they would otherwise be. Powerplant savings alone could be worth $50 billion in avoided investments over the next 15 years.

The act also protects the investment that is made by reducing the potential for forecast errors. This benefits both gas and electric utilities as well as producers of energy from the risk of gluts or shortfalls. This issue of reducing forecasting uncertainty is elaborated in the written testimony.

Electric utilities have already lost over $20 billion in wasted investment over the past 10 years due to forecasting errors.

Business also benefits from this legislation. First, the money saved by consumers on energy costs will be spent on other activities, fostering job creation, and economic growth through the economic multiplier effect. Second, business will benefit from lower utility rates and from savings due to their own use of more efficient appliances. Appliance manufacturers also benefit from this act as they have just testified.

The act enhances national security by reducing the need for oil imports. Oil and gas savings projected from this bill are $160,000 barrels of oil per day equivalent by the year 2000 from savings and gas appliances alone, plus additional possible savings from electricity generation.

The benefits from this bill are just as important, perhaps even more important with today's lower oil prices than they were previously. The energy savings calculated by Mr. Geller were calculated from a baseline that assumes continuing increases in appliance efficiency, even without standards.

If the base case were less optimistic, for example, if energy use bounces back due to lower oil prices, then the savings from the bill could be several times as large as those calculated. The standards provide the assurance that efficiencies will increase regardless of what oil prices do.

This also helps keep oil prices low by reducing demand pressure. Assurance of future efficiency levels is especially important to utilities which may need to construct new powerplants in the 1990's unless efficiencies can be counted on to increase.

In conclusion, it is not common that government policy is able to yield benefits for so many people without their also being losers. But this legislation offers gains to virtually everyone in the economy without offering negative impacts on almost anybody. It benefits both business and consumers and it insists on keeping the environment clean.

NRDC joins with the applicance industry in a growing coalition to urge prompt passage of this legislation.

Thank you very much, and we will be pleased to respond to questions.

[The prepared statement of Dr. Goldstein follows:]

Natural Resources
Defense Council

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TESTIMONY OF THE NATURAL RESOURCES DEFENSE COUNCIL
BEFORE THE UNITED STATES SENATE
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION
IN SUPPORT OF
THE NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986, S. 2781

September 16, 1986

By David B. Goldstein, Ph.D.
and David B. Edelson

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I. Introduction

The Natural Resources Defense Council (NRDC) is a national environmental organization with over 62,000 members and contributors. NRDC has been involved in planning for energy efficiency on the national and state level for over a dozen years, and has focused throughout that time on obtaining efficiency improvements from appliances.

The National Appliance Energy Conservation Act of 1986 represents an achievement unique in the history of our involvement in energy: a consensus proposal in which a compromise position acceptable to all parties has been negotiated. The major proponents of this bill have been on opposite sides of administrative and judicial disputes for over ten years. This legislation will resolve most of the disagreements and provide the nation with a wide array of benefits to an extremely broad range of beneficiaries.

Supporting it are a broad spectrum of groups that traditionally have disagreed on major energy planning issues: environmental and consumer organizations along with appliance manufacturer and homebuilder organizations; publicly owned and privately owned utility organizations and their regulators; and state and regional governmental agencies. Some of the reasons for this unusually broad base of support are described in Section II below. The process of arriving at such a compromise is described in Section III. Some of the effects of the bill are presented in Section IV.

II. Benefits of this Legislation

This bill demonstrates how environmental protection can go hand in hand with economic growth, the creation of new jobs, and consumer protection. The standards provided explicitly in the bill, along with future standards that DOE is required to set, will save money for consumers and businesses, reduce financial risk for utilities, and reduce the need for fossil fuel combustion, resulting in significant decreases in pollution.

The standards contained in this bill are estimated by the American Council for An Energy Efficiency Economy (ACEEE) to save 22,000 megawatts of peak electric power by the year 2000. Thus, this bill saves the equivalent of one quarter of the capacity of the entire U.S. nuclear program in only 14 years. Cumulative energy savings by the turn of the century exceed 17 quads, considerably more energy than is contained in the areas off the California coast that the Department of Interior is proposing for oil and gas leasing.

The ACEEE study shows a savings to consumers of over $28 billion nationwide, or a cost reduction of over $250 for an average American family. These savings were calculated conservatively by subtracting the increased cost of the more efficient appliances from the direct savings in energy use multiplied by the average electric, gas or oil prices to consumers and by accounting for predicted efficiency improvements in the absence of standards.

Actual savings are likely to be considerably larger, as utilities are able to defer expensive generating capacity and avoid the need for rate increases to finance them. As an example of such savings, constructing enough coal capacity to supply 22,000 megawatts would cost America utilities some $50 billion, a construction cost considerably larger than the entire calculated value of energy savings to consumers.

These reductions in energy use can lead to substantial reductions in air pollution. For example, the California Energy Commission calculated that its refrigerator standards would reduce emissions of nitrogen oxides by 5% statewide and emissions of sulfur oxides by 20%. These two pollutants are major precursors to acid rain. If these energy reductions are provided in the context of acid rain control legislation, they can help produce major reductions in the emissions of these precursor pollutants and also reduce the cost of clean up for utilities.

Utilities are a major beneficiary of this bill. Appliance efficiency standards allow utilities prudently to forecast energy savings and to reduce power plant construction needs accordingly. This helps them in two ways. First, it reduces overall investment requirements, keeping rates lower than they would otherwise be and protecting the utilities' financial standing. Second, it reduces the risk of over-building or under-building because of inaccurate forecasts of appliance energy usage. These reductions in risk benefit both electric and gas utilities as well as producers. Erroneous forecasts have cost the electric utility industry over $20 billion in wasted investment, according to DOE analyses.

Businesses benefit both directly and indirectly from these energy savings. Money saved by consumers on their energy bills will be spent on other activities, fostering job creation and economic growth. Analysis by the California Energy Commission has shown significant economic multiplier effects from conservation savings. Business also benefits from lower utility rates and from cost reductions resulting from their own use of appliances.

Appliance manufacturers benefit from this bill by obtaining increased certainty in planning their products and by being protected from a potential patchwork of state regulations. Also, appliance manufacturers will increase their own sales volumes through the substitution of sales of more efficient (and more expensive) appliances for current models.

Finally, this legislation helps enhance national security by reducing the need for energy imports. Projected savings in oil and gas, which translate into reductions in oil imports, are 160,000 barrels per day equivalent by the year 2000.

In sum, everyone wins if this legislation is passed. This is perhaps why the bill has obtained such a broad base of support from public interest and business organizations and virtually no opposition.

III. A Consensus Approach to Setting Appliance Efficiency Standards

This bill is a product of negotiations between the Natural

Resources Defense Council and the three major appliance trade associations and also incorporates the views of states and other interested parties. These negotiations, extending over several months, were difficult for all parties. There were substantial differences in the opinions and perspectives that the parties brought to the negotiating table. During the negotiating process, both sides gained a greater respect for and understanding of the needs and problems of the others.

The resulting agreement effected in the legislation is a compromise. Both sides benefit from the uniformity of national regulation: if only half of the states were to adopt standards, consumer and environmental interests would lose the predictability of savings in the other states, while manufacturers would find it more difficult than complying with the standard in all 50 states.

The level of standards provided explicitly in the bill requires a significant level of product redesign. Table I displays the percentages of appliance models currently on the market that must be redesigned to meet the standards over a period of 3 to 5 years. The percentages are high, up to 90%. Despite the extensiveness of redesign involved, appliance manufacturers believe that the levels of efficiency are feasible and practicable.

Energy savings to be expected from the bill are significant. The magnitude of savings is discussed in Section IV. However, the standards fall short of achieving the maximum level of conservation that is technologically feasible and economically justified as would be required from DOE under both existing law and this legislation. This is one of the reasons that the Department of Energy remains in the picture and is required to set future standards on a firm schedule.

Past DOE (and state) proceedings have been contentious, and both DOE and state standards have resulted inevitably in litigation. The interim standards provided in this legislation eliminate uncertainty and advance the effective date of standards compared to reliance on DOE or the states if the legislation were not enacted.

Manufacturers can begin immediately to redesign their products to meet known performance targets on fixed dates, confident that products designed to meet these standards can be sold nationwide. Utilities and their consumers benefit by being able to eliminate plans for power plants immediately, without the need to invest money as a hedge against the risk that DOE might not set standards at reasonable levels, or that the standards might not withstand litigation.

The explicit standards contained in the bill are generally more stringent than the state standards prevailing at the time of their effectiveness. For example, the refrigerator standard saves about 5% more than the most stringent state standard in effect in 1990, that of California. The freezer standard saves about 15% compared to the California requirement. The furnace efficiency requirement is significantly more stringent than that in effect in any state, providing additional energy savings of 10% compared to California's furnace efficiency standards.

The only major issue about which participants in the negotiation could not agree was the establishment of a national refrigerator/freezer standard based on the 1992 California requirement. Rather than resolving this issue directly, the legislation basically perpetuates the status quo. It requires the Department of Energy to resolve the technical disputes through its rulemaking process, and provides that the existing California standard not be preempted unless DOE acts. (Under current law, California standards also would not be preempted unless DOE acts.)

IV. Calculations of Energy Saved By the Legislation

This legislation will result in significant savings in energy consumption by establishing initial energy conservation standards for eleven major home appliances. These appliances account for approximately 24% of electricity consumption in the United States. Further energy savings will be obtained as DOE revises the standards according to the schedule and criteria set forth in the new Act.

The effect of the interim standards on national utility energy consumption can be computed in a number of different ways; each method produces a different type of answer. These differing types of answers concerning energy savings reflect different ways of framing the energy policy question. The first, and most simple, summarized in Table II, compares the interim standards adopted in this Act with the most stringent existing state standards and with typical products currently on the market. The right hand column, percentage energy savings, compares the estimated energy consumption of products that currently comply with the standards proposed in the Act with the energy consumption of typical existing appliances. As noted, energy consumption is generally about 20% lower for products that currently meet the standards than for average existing products.

The next level of sophistication is the forecast presented by the American Council for An Energy Efficienct Economy (ACEEE). This calculation is analogous to that performed by DOE in its rulemaking. It projects energy consumption with the standards, and then projects energy consumption in a base case, and subtracts the difference. In the base case, it relies on historic trends of efficiency improvement as well as the projections of the appliance industry, where these are available. Energy savings are calculated for appliances sold before the turn of the century, because further extensions of the computation, although theoretically more correct (since the standards will indeed be in effect for more than the rest of the century) become increasingly meaningless because of the likelihood that DOE will set more demanding standards following the provisions of this Act in future years.

The results of this calculation are cumulative savings of 17 quads of energy for all appliances sold by the year 2000, and a reduction in electrical capacity needs of 22,000 megawatts, the full output of 22 large power plants, or the equivalent in capacity of one quarter of the entire U.S. nuclear program. Present value savings to consumers, based on national average utility rates, are $28 billion or over $250 per household. Reductions in gas usage from gas appliances add to 160,000 barrels of oil equivalent per day by the year 2000; further reductions in oil use from peak electricity generation can be anticipated.

A more sophisticated framing of the issue would show a range of appliance energy consumption forecasts in the base case, which would vary depending on the forecaster's perception of the responsiveness of the market, the likelihood of state regulation, the policy maker's predictions of whether energy prices would rise or fall, as well as variations in economic growth. In this base case, the energy forecaster would be confronted with a range of possible futures for appliance energy consumption and energy use in general.

There is considerable debate over which of the possible base case projections is most plausible. NRDC has argued in the DOE proceedings that the projections of market progress used by DOE, which are similar to those employed in the ACEEE study, are overly optimistic and understate savings. Unfortunately, there is no factual basis for accepting any specific base forecast: the future of energy efficiency is uncertain in the absence of standards.

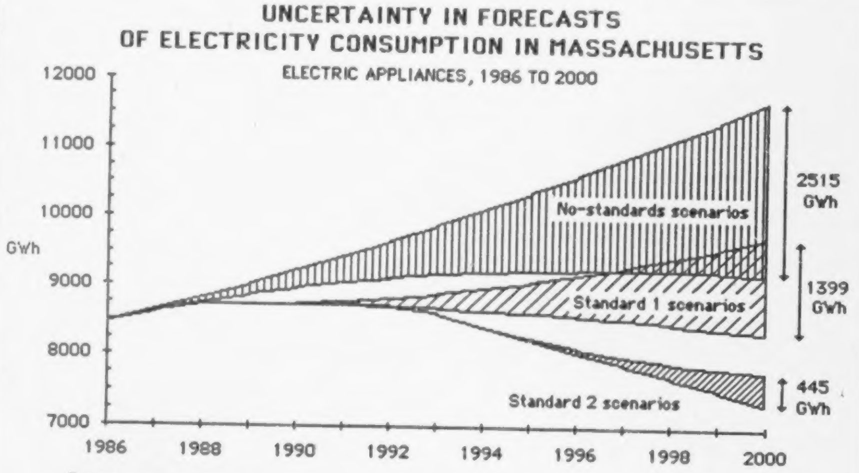
With appliance standards, much of this uncertainty can be eliminated. All forecasts of energy use must assume that appliances use no more energy than provided by the standards. This results not only in the lower mean forecast, but in less variation between the high and the low cases. This is illustrated by Figure 1, taken from a forecast for the Commonwealth of Massachusetts. The impact of this bill falls somewhere between the Standards 1 and Standards 2 bands on the figure. The range of uncertainty with the standards is less than half of the range without them. Such reduction in uncertainty is a major economic benefit to utilities, exclusive of the other benefits from direct energy savings. This type of analysis, performed on a regional, state, or utility basis, provides the best indication of the value of appliance efficiency standards.

The overall benefits of this bill therefore exceed the numerical estimates computed by a wide margin.

It is not common for the government to be able to establish a policy that helps so many of its citizens and businesses without there also being "losers". But this legislation offers economic gains to virtually everyone: to all regions, to consumers and manufacturers, and to the environment.

NRDC joins with the appliance industry in a growing coalition to urge passage of this legislation.

Figure 1.
Effect of Appliance Standards on Energy Forecasts



* These are forecasts of end use consumption and as such do not include transmission and distribution losses or reserve margin requirements.

Table 1: Redesign Requirements of Appliance Standards in the National Appliance Energy Conservation Act
(Revised 9/12/1986--see Notes, P.2)

Appliance	Product Category		Percent Redesign
Refrigerators (1)	Top-Freezer Auto Defrost*		89%
* includes models with through-the-door ice.	Side-Freezer Auto Defrost*		92%
	Manual Defrost		42%
Freezers (1)	Chest		83%
	Upright manual		87%
Room Air Conditioners (2)	No Reverse Cycle -with side louvers		
		< 6,000 Btu/hr	78%
		6 < 7,999 Btu/hr	49%
		8 < 13,999 Btu/hr	56%
		14 < 19,999 Btu/hr	81%
		20,000 Btu/hr <	60%
	Reverse Cycle -with side louvers		17%
	No Reverse Cycle -w/o side louvers		
		< 6,000 Btu/hr	0%
		6 < 7,999 Btu/hr	45%
		8 < 13,999 Btu/hr	76%
		14 < 19,999 Btu/hr	100%
		20,000 Btu/hr <	*
	Reverse Cycle -w/o side louvers		0%
Central Air Conditioners (3)			
	Split System		90%
	Package System		89%
Furnaces (4)	Oil Boiler		57%
	Oil Furnace		58%
	Gas Boiler		79%
	Gas Furnace		79%

* No models offered.

Table 1 Notes:

1) NRDC sort of AHAM 1986 Directory of Certified Refrigerators and Freezers, Edition #2, June, 1986

2) NRDC sort of AHAM 1986 Consumer Selection Guide For Room Air Conditioners. The earlier version of this table contained an error which omited the redesign percentages for air conditioners over 20,000 BTU/hr, and substituted the percent redesign for the Reverse Cycle with Side Louvers category, which in turn was left blank. Other small variations in the redesign numbers reflect differences with the AHAM sort which includes Special Application Models and other unique classes which were not considered in the original NRDC sort.

3) ARI 3rd Quarter 1985 Efficiency Statistics of nationally-shipped units, Figure 4 of ARI Submission to Massachusetts Executive Office of Energy Resources, March, 1986.

4) Sort of GAMA Consumers' Directory of Certified Furnace and Boiler Efficiency Ratings, May 1986, done by Glenn Reed, Massachusetts Executive Office of Energy Resources. These numbers differ from the previous version of this table because they were based on an AFUE of 78% according to GAMA's indoor air/indoor furnace test. Since the bill specifies 78% AFUE using outdoor air, the rule-of-thumb adjustment to the indoor test is 2% AFUE upward. Thus the sort is computed at the 80% AFUE level in this version, not the 78% AFUE level.

Table 2

National Appliance Energy Conservation Act
Effect of Standards

Appliance Type	Typical Efficiency	Act Efficiency	Complying Efficiency	State Efficiency	% Savings
Refrigerators	1140 kWh/yr	976 kWh/yr	894 kWh/yr	1023 kWh/yr (CA'87) 722 kWh/yr (CA'92)	22%
Freezers	723 kWh/yr	612 kWh/yr	492 kWh/yr	737/yr (CA '87) 511 kwh/yr (CA'92)	32%
Room Air Conditioners	7.5 EER	8.6 EER	9.0 EER	8.4 EER (CA'79) 8.45 EER (NY'88-prop.) 8.7 EER (NY '92-prop.)	20%
Central Air Condtioners	8.8 SEER	10.0 SEER	10.3 SEER	9.5 SEER (NY'85) 9.9 SEER (CA'93)	17%
Water Heaters					
Gas	.484 EF	.544 EF	.554 EF	.524 EF (ASHRAE/CA)	13%
Electric	.807 EF	.884 EF	.894 EF	.864 EF (ASHRAE/CA)	10%
Furnaces	70% AFUE	78% AFUE	84% AFUE	71% AFUE (CA'78)	20%

Source: NRDC estimates based on work done for the NRDC "Massachusetts Appliance Efficiency Report" and AHAM statistics.

Revised 9/5/86

Table 2, continued

This table estimates the unit energy savings from the explicit standards contained in the National Appliance Energy Conservation Act. Savings are predicted by comparing the energy consumption of a "typical" unit that meets the standards (column labelled "Complying Efficiency") with that of a current unit (column labelled "Typical Efficiency"). Since the Act sets minimum performance levels, the average efficiency of complying units will be higher (lower energy consumption) than the explicit level in the Act ("Act Efficiency"). The most stringent existing and proposed standards in major states are presented for comparison. The 1992 California refrigerator and freezer standards would not be pre-empted by the standards set explicitly in the Act. Pre-emption of the California standards would only occur if the Department of Energy promulgates a new standard before 1990.

Senator EVANS. Thank you.
Mr. Geller.

STATEMENT OF HOWARD S. GELLER, ASSOCIATE DIRECTOR, AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Mr. GELLER. Thank you, Mr. Chairman. My name is Howard Geller. I'm the associate director of the American Council for an Energy Efficient Economy, abbreviated as ACEEE.

ACEEE is a nonprofit organization which gathers, evaluates, and disseminates information to stimulate greater efficiency. We have worked extensively on the analysis and promotion of more efficient appliances and appliance efficiency standards.

After many years of disagreement with appliance manufacturers concerning efficiency standards, it is a great pleasure to come together with industry representatives in support of the National Appliance Energy Conservation Act of 1986, S. 2781.

National appliance efficiency standards, authorized by Congress in the EPCA legislation passed in 1975, are long overdue. The consensus standards contained in S. 2781 are a reasonable compromise that will save consumers tens of billions of dollars, eliminate the need for numerous expensive, risky and polluting powerplants, provide both utilities and appliance manufacturers with a more certain market environment, and help appliance manufacturers to innovate and remain competitive with foreign manufacturers.

I have completed a detailed analysis of the energy and economic savings that can be expected from the consensus national appliance efficiency standards proposed in S. 2781. I summarize the results of the analysis here in my testimony. The complete study is available for the hearing record if the subcommittee is interested.

My analysis considers the energy use, first cost, and operating cost of eight major products covered in the bill. Future energy use is compared under a marketplace scenario where national standards are not in effect, and a standards scenario.

The analysis shows that by the year 2000 the proposed standards will reduce electricity consumption by 53 billion kilowatt hours per year and will reduce peak summer demand by 22,000 megawatts. The anticipated reduction in peak demand is equivalent to about 10 percent of the growth in national peak demand as forecast by the utility industry during the next 15 years.

Lowering peak demand by 22,000 megawatts would mean that utilities can avoid investing about $25 billion in new powerplants. In terms of total electricity and fuel savings, it is estimated that the standards will lower residential energy use by nearly one quad by the year 2000. This is equal to about 6 percent of residential energy consumption at the present time.

Over the lifetime of products sold during the next 15 years the standards are expected to lower residential energy use by 17 quads. This is equivalent to over 2 years of energy imports at America's net import rate in 1985.

I estimate that the overall energy savings will be split nearly equally between natural gas and electricity. Both electric and gas utilities will benefit from having products that are more energy efficient and more economical for consumers.

The net economic savings for consumers over the lifetime of products sold during the next 15 years is expected to be about $28 billion, equivalent to nearly $300 per household. This $28 billion of net savings for consumers means that money is freed up for other productive investments benefiting consumers as well as our entire economy.

I want to acknowledge you are dealing with the future so there is considerable uncertainty about the exact magnitude of the energy and economic savings from the appliance standards. I believe, however, that I made relatively conservative assumptions to arrive at the savings values just described.

With stagnant energy prices now in the near future, efficiency improvements in the marketplace may be less than current expectations. Thus, the savings from standards may be even greater than I have estimated. The standards contained in S. 2781 are a reasonable compromise following years of heated debate. Any delay in passing the bill risks losing the virtually unanimous consensus that exists for adopting this particular standards proposal.

Moving forward now means that consumers, manufacturers, and utilities benefit from appliance standards without further delay. Everybody wins. On the other hand, every year that passes without standards in place costs our Nation billions of dollars.

As a representative of energy conservation advocates, I urge Congress and the President to adopt S. 2781 this year. The bill has been carefully reviewed by many organizations and has received extremely broad endorsement. Prompt passage of this legislation would be the most important initiative in support of energy conservation at the national level so far this decade.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Geller follows:]

TESTIMONY OF:

HOWARD S. GELLER, ASSOCIATE DIRECTOR
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY
WASHINGTON, DC

PRESENTED TO:

SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION
COMMITTEE ON ENERGY AND NATURAL RESOURCES

U.S. SENATE

HEARING ON:

THE NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

SEPTEMBER 16, 1986

I. Introduction

The American Council for an Energy-Efficient Economy (ACEEE) is a non-profit organization which gathers, evaluates and disseminates information to stimulate greater energy efficiency. ACEEE has worked extensively on the analysis and promotion of more efficient appliances. We have issued numerous publications on the subject of efficient appliances and policies to promote their use including a handbook titled Energy Efficient Appliance$.

ACEEE has analyzed appliance efficiency standards on a number of occasions during the past five years. Previous assessments were presented to the Department of Energy and as testimony before Congress. Also, we have been assisting states in the development and analysis of minimum efficiency standards because the federal government has failed to enact such standards to date.

After many years of disagreement with appliance manufacturers concerning efficiency standards, it is a great pleasure to come together with industry representatives in support of The National Appliance Energy Conservation Act of 1986 (S. 2781). National appliance efficiency standards, authorized by Congress in the EPCA legislation passed in 1975, are long overdue. The consensus standards contained in S. 2781 are a reasonable compromise that will benefit consumers, manufacturers, utilities, and our nation as a whole. Specifically, these efficiency standards will:

- save consumers tens of billions of dollars,
- eliminate the need for numerous expensive, risky, and polluting power plants,

- o provide both utilities and appliance manufacturers with a more certain market environment,
- o help our appliance industry to innovate and remain competitive with foreign manufacturers,
- o be achieved without undue burden to manufacturers.

ACEEE urges Congress to adopt these standards as soon as possible so that our nation can benefit from meaningful appliance standards without further delay.

Preventing the sale of inefficient appliances through national standards is necessary for a number of reasons. First, there is great variation in the efficiency of residential products in an unregulated marketplace. Highly efficient appliance models now commercially available consume 25-50% less energy than typical models produced in recent years. Second, consumers generally are not aware of how much it costs to operate individual appliances. Consumers pay relatively little attention to appliance efficiency and they rarely select products that minimize "life-cycle cost" (i.e., the combination of initial cost and operating cost). Third, a large fraction of furnaces, air conditioners, water heaters, and other products are purchased by builders, contractors and landlords. These "third party purchasers" usually do not pay the operating costs and thus have no incentive to buy slightly more expensive yet more energy-efficient products. Fourth, uniform national standards will prevent a patchwork of state regulations, a factor of extreme importance for appliance manufacturers.

II. Energy and Economic Savings Potential

I have completed a detailed analysis of the energy and economic savings that can be expected from the consensus national appliance efficiency standards proposed in S. 2781 [1]. The methodology and results of the analysis are summarized in the remainder of my testimony.

Methodology

Energy and economic savings are calculated on a product-by-product basis for the following major products:

- o refrigerators
- o freezers
- o electric water heaters
- o room air conditioners
- o central air conditioners and heat pumps
- o gas furnaces
- o gas water heaters
- o gas ranges.

Space heaters, dishwashers, clothes washers, and swimming pool heaters are included in the bill but not in this analysis because the savings for these products are difficult to estimate and are unlikely to be as large as for the other products.

The analysis considers the energy use, first cost, and operating cost of products sold between 1986 and 2000. National product sales are projected year-by-year along with the anticipated energy use of typical models produced under a "marketplace scenario" (i.e., without national standards) and a "standards scenario". Improvements in efficiency in the marketplace scenario are based on estimates provided by industry associations where available.

The analysis includes the energy and dollar savings over the lifetime of products sold during 1986-2000. The economic analysis is done in terms of constant 1985 dollars using a 5% real discount rate for equipment and energy costs in the future. The extra first cost for more energy-efficient models is estimated based on previous studies. Also, it is assumed that the average residential energy prices in 1985 -- $0.078/kWh for electricity and $6.06/MBtu for natural gas -- remain level in constant dollars (i.e., energy prices do not rise faster or slower than inflation).

The refrigerator and freezers standards contained in S. 2781 would become effective in 1990. It is very likely that these standards will be upgraded following a rulemaking by the Department of Energy. Otherwise, according to S. 2781, the refrigerator and freezer standards adopted in California for 1992 become effective there in 1993. In this analysis, it is assumed that California's 1992 refrigerator and freezer standards are adopted nationwide and become effective as national standards in 1995 (three years after the potential effective date in California).

Results

A supporting report [1] contains detailed savings results year-by-year. Table 1 attached to this testimony shows the overall electricity savings results. By 1995, the proposed efficiency standards are expected to reduce electricity consumption by 30.4 TWh/yr with peak summer demand reduced by 12,800 MW. By 2000, it is estimated that the proposed standards will reduce electricity consumption by 53.5 TWh/yr and peak summer demand by 22,000 MW. Water heaters account for the largest portion of the electricity savings (39% in 2000) while central air conditioners and heat pumps account for 56% of the peak demand savings. The anticipated reduction in peak demand in 2000 is equivalent to about 10% of the growth in national peak demand forecast by the utility industry during 1986-2000.

Table 2 shows the overall energy savings (i.e., both electricity and fuel savings). In this table, electricity is considered on a primary basis (i.e., using the energy input to a thermal power plant -- 11,500 Btu per kWh). It is estimated that the standards will lower residential energy use by 553 TBtu (trillion Btu) in 1995 and 959 TBtu in 2000. The latter value is equal to about 6% of residential energy consumption at the present time.

Over the lifetime of products sold during 1986-2000, it is estimated that the standards will lower residential energy use by 17 Quads (quadrillion Btu). This is equivalent to over two years of energy imports at America's net import rate as of 1985 (net imports are imports minus exports). Gas water heaters are the product with the most energy savings (26% of the total), followed by refrigerators and electric water heaters. The overall energy savings will be split nearly equally between natural gas and electricity. Gas utilities as well as electric utilities will benefit from having products that are more energy-efficient and more economical for consumers.

Table 3 shows the principal economic savings results. Economic savings are expressed in terms of operating savings for consumers in 1995 and 2000 as well as net lifetime savings. The latter is the savings in lifetime operating costs minus the estimated extra first cost as a result of imposing the efficiency standards. The benefit-cost ratio included in Table 3 is the value of lifetime savings divided by the extra first cost for consumers. All values are expressed in 1985 dollars.

The proposed appliance standards are expected to lower consumers' energy bills by $2.6 billion per year by 1995 and $4.0 billion per year by 2000. The net economic savings for consumers over the lifetime of products sold during 1986-2000 is $28.2 billion. This is equivalent to nearly $300 per household. $28 billion of net savings for consumers means that money is freed up for other productive investments benfitting consumers as well as our entire economy.

From the perspective of consumers, the overall benefit-cost ratio associated with appliance standards on the eight major products is estimated to be 2.7. The benefit-cost ratio is greater than 1.0 for all of the products. It ranges from 1.2 for central air conditioners to 8.7 for gas water heaters. The relatively low benefit-cost ratio for air conditioners is due to the substantial first cost premium now associated with increasing the efficiency of this product.

It is also possible to consider the investment in utility plant that can be avoided as a result of the standards. Assuming that half the 22,000 MW of the avoided peak demand would otherwise be provided by peaking gas turbines costing $500/kW on average and that half the capacity would be provided by baseload or cycling plants costing $1500/kW on average, the avoided investment in power generation alone is nearly $24 billion (1985 dollars). In addition, utilities will save on investments in power transmission and distribution facilities, as well as power plant operation and maintenance.

Since the energy and economic savings analysis depends on assumptions regarding manufacturer and purchaser behavior in the future in both the marketplace and standards scenarios, the analysis is inherently uncertain. But relatively conservative assumptions were made in arriving at the results described above. In particular, I assumed that there will be considerable improvement in the efficiency of most products in the future in the absence of national standards. The energy and economic savings resulting from such improvements are not counted as savings due to standards. However, with stagnant energy prices now and in the near future, efficiency improvements in the marketplace may be less than recent trends and current expectations. Thus, the savings from standards may be even greater than I have estimated.

III. Conclusion

Even though there are uncertainties regarding the exact magnitude of the benefits from national appliance standards, it is clear that the benefits will be large -- billions of dollars of savings for consumers and thousands of MWs in avoided power plants. Mandatory national appliance efficiency standards guarantee that our nation benefits from more energy-efficient appliances.

The standards contained in H.R. 5465 are a reasonable compromise following years of heated debate. Any modification or delay in passing the bill risks losing the virtually unaminous consensus that exists for adopting this particular standards proposal. Moving forward now means that consumers, manufacturers, and utilities will benefit from appliance standards without further delay. Everybody wins. On the other hand, every year that passes without standards in place costs our nation billions of dollars.

As a representative of energy conservation advocates, I urge Congress and the President to adopt H.R. 5465 without change this year. The Bill has been carefully reviewed by many organizations and has received extremely broad endorsement -- the list of endorsing organizations ranges from Friends of the Earth to the Edison Electric Institute to the Hydronics Institute -- an almost miraculous coalition that may never be repeated. Prompt passage of this legislation would be the most important initiative in support of energy conservation at the national level so far this decade.

Thank you for the opportunity to present these views.

Reference

1. H.S. Geller, "Energy and Economic Savings Potential from National Appliance Efficiency Standards", American Council for an Energy-Efficient Economy, Washington, DC, Aug. 1985.

TABLE 1
Appliance Standards Analysis
Electricity Savings Summary

	Savings by 1995			Savings by 2000		
Product	Annual (TWh/yr)	Lifetime (TWh)	Peak (MW)	Annual (TWh/yr)	Lifetime (TWh)	Peak (MW)
Refrig	6.83	130	912	13.86	263	1,851
Freezer	1.36	28	178	2.59	54	340
Wat. Ht.	12.64	164	1,559	20.87	271	2,573
Room AC	2.86	43	3,054	4.59	69	4,890
Cent. AC	6.68	80	7,120	11.62	139	12,385
TOTAL	30.37	445	12,823	53.53	796	22,039

TABLE 2
Appliance Standards Analysis
Energy Savings Summary

	Savings by 1995		Savings by 2000	
Product	Annual (TBtu/yr)	Lifetime (Quads)	Annual (TBtu/yr)	Lifetime (Quads)
Refrig	78.55	1.50	159.39	3.02
Freezer	15.64	0.32	29.79	0.62
El. WH	145.36	1.89	240.01	3.12
Room AC	32.89	0.49	52.79	0.79
Cent. AC	76.82	0.92	133.63	1.60
Furnace	68.43	1.57	121.78	2.80
Gas WH	115.04	2.65	190.19	4.37
Gas range	20.51	0.47	31.83	0.73
TOTAL	553.24	9.81	959.40	17.05

TABLE 3
Appliance Standards Analysis
Economic Savings Summary

	Savings by 1995			Savings by 2000		
Product	Annual Operation (10^6 $)	Net Lifetime (10^6 $)	Benefit-Cost Ratio	Annual Operation (10^6 $)	Net Lifetime (10^6 $)	Benefit-Cost Ratio
Refrig	378	3,216	3.37	670	5,696	3.37
Freezer	76	813	5.88	128	1,358	5.88
El. WH	727	5,989	8.14	1,068	8,798	8.14
Room AC	167	598	1.53	238	854	1.53
Cent. AC	377	537	1.19	582	829	1.19
Furnace	299	1,912	1.90	471	3,010	1.90
Gas WH	514	4,272	8.67	756	6,280	8.67
Gas range	95	960	7.09	132	1,325	7.09
TOTAL	2,633	18,297	2.69	4,045	28,150	2.69

ENERGY AND ECONOMIC SAVINGS POTENTIAL FROM NATIONAL APPLIANCE EFFICIENCY STANDARDS

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August, 1986

This analysis examines the energy and economic savings that can be expected from the national minimum efficiency standards for appliances recently agreed to by appliance manufacturers and conservation advocates. These standards levels are specified in legislation introduced in the U.S. Congress [1]. The proposed standards levels are listed in Appendix A. The savings are calculated on a product-by-product basis using a consistent methodology, as explained below.

I. Methodology

A. General

The analysis covers the following products included in the national appliance standards bill: refrigerators (R/F), freezers (FR), room air conditioners (RAC), central air conditioners and heat pumps (CAC and HP), electric water heaters (EWH), gas water heaters (GWH), gas furnaces and boilers (GF), and gas ranges (GR). Direct heating equipment (space heaters), dishwashers, clothes washers, and swimming pool heaters are included in the bill but not in this analysis because savings for these products are difficult to estimate and are unlikely to be as large as for the other products.

The analysis considers the energy use, first cost, and operating cost of products sold between 1986 and 2000. National product sales are projected year-by-year along with the anticipated energy use of typical models produced under a "marketplace scenario" (i.e., without national standards) and a "standards scenario". Improvements in efficiency in the marketplace scenario are based on estimates provided by industry associations where available. Specific assumptions are explained below for each type of product.

Product sales are projected by first taking the average number of shipments during 1981-1985. This value is considered the normalized shipment level for 1983. It is increased on an annual basis using the estimated rate of increase of the housing stock during 1983-2000, 1.33% per year [3]. The sales projections are included in the tables of results.

The analysis includes the energy and dollar savings over the lifetime of products affected by standards sold by the year 2000. The economic analysis is done in terms of constant 1985 dollars using a 5% real discount rate for equipment and energy costs in the future. The extra first cost for more energy-efficient models is estimated based on a constant cost increase per unit of energy savings. This value is derived from other studies as described below for each product. Average residential energy prices in 1985 -- $0.078/kWh for electricity and $6.06/MBtu for natural gas -- are used [2]. Also, it is assuming that prices remain level in constant dollars; i.e., prices do not rise faster (or slower) than inflation.

B. Refrigerators and Freezers

In the marketplace case, projections by AHAM of the average electricity consumption of new models produced in 1987, 1990, and 1996 are used [4]. During 1996-2000, the same rate of decrease in new product UEC as during 1990-96 (1.6%/yr for R/Fs, 1.7%/yr for FRs) is assumed.

According to AHAM, the shipment-weighted maximum electricity use is 976 kWh/yr under the 1990 R/F standard and is 671 kWh/yr under the FR standard. Of course, there will be some distribution of shipments whose average electricity use is below these ceilings. It is assumed that the marketplace average is 7.5% below the ceilings the year that the standard goes into effect. This assumption is based on discussions with AHAM [4] and experience in California when state refrigerator and freezer standards became effective there [5].

It is highly likely that the 1990 R/F and FR standards will be upgraded through a DOE rulemaking given the provisions in the proposed standards bill. This is necessary in order to avoid having California (and possibly other states) adopt the 1992 California R/F and FR standards effective in 1993. It is uncertain what the exact outcome will be -- no doubt conservation advocates will be arguing for a major strengthening while manufacturers will attempt to limit the increase in stringency. In this analysis, it is assumed that the 1992 California standard levels are adopted as national standards effective in 1995. This assumption is conservative to the extent that R/F and FR standards could be revised as early as 1993.

During the period 1996-2000, the same rate of decrease in new product UEC is assumed in the standards case as in the marketplace case. Other assumptions include a 19 year lifetime for R/Fs and 21 year lifetime for FRs [6], and peak-to-average load factors of 1.17

for R/Fs and 1.15 for FRs [7].

The extra first cost for reducing the electricity consumption of R/Fs and FRs is derived from the standards analysis conducted by the California Energy Commission [8]. In the efficiency ranges of interest, the increase in first cost is assumed to be $0.26 per kWh/yr of savings for R/Fs and $0.17 per kWh/yr of saviings for FRs (in 1985 $).

C. Water Heaters

The water heater UEC values are based on a constant hot water demand of 43 gal/day for an average household (2.7 persons) [9]. It is assumed that the shipment-weighted energy factor (EF) ratings in 1984 were 0.494 for GWHs and 0.836 for EWHs. These estimates were made by Lawrence Berkeley Laboratory based on limited shipment data [10]. The EF ratings are corrected to account for the different water consumption levels in the test procedure and in a typical household.

In the marketplace case, it is assumed that the moderate increases in new product efficiency experienced during 1978-1984 continue in the future. The rates of increase are 0.4%/yr for GWHs and 0.6%/yr for EWHs.

In the standards case, it is assumed that the average new model is 5% more efficient than the minimum level the year that standards go into effect (1990). The relatively low margin in this case is due to the narrow range of efficiencies now offered in excess of the standards levels. After the standards become effective, the same rates of efficiency improvement as in the marketplace case are assumed.

The extra first cost for increasing the efficiency of water heaters is derived from the engineering analysis sponsored by DOE when it considered standards during the early 1980s [6]. In the range of interest, increasing the efficiency of EWHs is assumed to cost $3.70 per unit of EF or $0.09 per kWh/yr of savings and increasing the efficiency of GWHs is assumed to cost $2.70 per unit of EF or $6.56 per MBtu/yr of savings. Other key assumptions for water heaters are a 13 year lifetime [6] and peak-to-average load factor of 1.08 [7].

D. Room Air Conditioners

The proposed 1990 RAC standards vary according to the capacity of the RAC unit (see Appendix A). According to AHAM, the shipment-weighted average standard level is an EER of 8.6 [4]. This is 15% greater than the shipment-weighted EER in 1984. With an average capacity of 10,200 Btu/hr and an average usage level of 750 hrs/yr [4], an 8.6 EER corresponds to 896 kWh/yr of electricity consumption.

In the marketplace case, it is assumed that the electricity use of new models declines 1.5%/yr during 1984-90, and 1.0%/yr during 1991-2000. These forecasts were provided by AHAM [4]. In the standards case, it is assumed that the average model sold in 1990 is 7.5% more efficient than the minimum indicated by the standard, the same margin used for refrigerators and freezers. A 1.0%/yr decline in the electricity use of new products is assumed during 1991-2000.

The extra first cost for increasing the efficiency of RACs is derived from the DOE engineering analysis published in 1982 [6]. The cost premium is $63 per unit of EER (in 1985 $), or $0.53 per kWh/yr of savings at the assumed usage level. Also, a 15 year lifetime is assumed along with a 75% diversification factor for determining coincident peak demand (i.e., aggregate peak demand is equal to 75% of installed RAC wattage).

E. Central Air Conditioners and Heat Pumps

The proposed national standards are an SEER rating of 10.0 for split system CACs and HPs beginning in 1992 and an SEER rating of 9.7 for packaged units beginning in 1993. Since about 85% of shipments are split systems, it is reasonable to assume the effective standard is an SEER of 9.95 as of 1992. For comparison, the shipment-weighted SEER rating for CACs and HPs was 8.75 in 1985 [11].

The electricity consumption of CACs and HPs is calculated assuming an average capacity of 35,000 Btu/hr and an average cooling use of 750 hrs/yr, as indicated by the CAC industry [11, 12]. This corresponds to 3000 kWh/yr of electricity use for cooling at the 1985 SEER level of 8.75. In the marketplace case, it is assumed that the average efficiency of new models rises 1.5%/yr during 1985-90 and 1.0%/yr during 1991-2000. These rates are somewhat lower than those recently experienced (the average rate of increase was 2.0%/yr during 1982-85). Declining rates of efficiency improvement are forecast because of anticipated stability in electricity prices and rising costs for efficiency improvements as SEER advances.

In the standards case, it is assumed that the average efficiency is 10% greater than the minimum the year the standards become effective (i.e., an SEER of 10.95 in 1992). This margin is based on the wide range of efficiencies produced (models with an SEER rating as high as 15.5 are already available) and the popularity of utility rebate programs that encourage the purchase of highly efficient models. During 1993-2000, the same rate of efficiency increase as in the marketplace case (1.0%/yr) is assumed.

In this analysis, electricity savings resulting from the use of HPs for heating is not accounted for. This underestimates the savings potential from standards because there will be a reduction in electricity consumption for heating as well as cooling. However, the heating efficiency of HPs is not regulated, making it difficult to estimate savings on the heating side.

Regarding the extra first cost associated with increasing the efficiency of CACs and HPs, there is currently a first cost premium of about $320 per unit of SEER for systems of average capacity in the SEER range of 8.5 to 12.0 [13]. This high cost premium is expected to fall when less efficient equipment is eliminated from the marketplace and the market share for highly efficiency equipment expands. Once the CAC and HP standards becomes effective in 1992-93, a first cost premium of $160 per unit of SEER improvement is assumed for a typical CAC or HP.

Other key assumptions include a 12 year lifetime [6] and a 75% diversification factor when estimating peak load.

F. Central Furnaces and Boilers

Based on data collected by GAMA, it is estimated that the average AFUE rating of new furnaces reached about 0.74 in 1985, up 2.1%/yr on the average during 1978-85 [14]. In the marketplace scenario, it is assumed this rate of increase falls to 1.0%/yr during 1986-90 and 0.5%/yr during 1991-2000. These rates are consistent with stable gas prices and are considered reasonable by GAMA [14].

The furnace and boiler standard, a minimum AFUE rating of 0.78 using the California isolated combustion test, implies that fuel-fired heating systems must be of the power burner or condensing flue gas design. Assuming that two-thirds of gas furnace and boiler shipments have a power burner and one third are condensing in 1992 (the year the standard becomes effective), the average AFUE that year would be about 0.86. This is 10% greater than the minimum level. The same rate of efficiency improvement is assumed during 1993-2000 in both the standards and marketplace cases.

Energy savings due to standards are estimated for gas furnaces and boilers only. Oil-fired equipment is not included because the average AFUE is already 0.78. Thus, a minimum efficiency standard at this level in 1992 will probably not have much impact.

Energy consumption for space heating is determined assuming an average space heating load of 45 MBtu throughout the 1986-2000 time period. This value is based on estimates indicating the national average heating load was 50 MBtu during the early 1980s [9,16], along with the assumption that the thermal integrity of housing gradually improves over time.

Estimating the extra first cost for increasing the efficiency of gas furnaces and boilers is problematic because there is a moderate increase in first cost for the addition of the power burner but a large incremental cost for condensing furnaces [12]. Assuming that two-thirds of shipments under standards feature the power burner and one third are condensing models, the average cost increase is $30.60 per unit of AFUE improvement based on DOE's cost data updated to 1985 dollars [12]. This corresponds to $43 per MBtu/yr of savings at the assumed heating load.

A 23 year lifetime is also assumed for the gas furnace and boiler analysis.

G. Gas Ranges

The proposed standards include a ban on pilot lights in gas ranges with an electrical connection. About 95% of all ranges produced have an electrical connection [14]. In recent years, 38-41% of all gas ranges produced included pilot lights [14]. This percentage has been falling slowly over time.

Once the pilot light ban becomes effective beginning in 1990, it is assumed that pilot lights are removed from 30% of all shipments. Furthermore, it is assumed that the removal of pilot lights lowers the gas consumption of a typical range from 8.7 MBtu/yr to 4.8 MBtu/yr [6].

The extra first cost for the replacement of pilot lights with electric ignition is based on the retail prices of otherwise identical models listed in the 1985 Sears catalog. This price difference is $40. Thus, pilot light removal reduces gas use at a cost of $10 per MBtu/yr of savings.

II. Results

A. Energy Savings

Tables 1-8 contain the energy savings results on a product-by-product basis. The tables include aggregate annual savings from the products sold in any particular year along with the cumulative annual savings from all products sold between 1986 and the year being considered. Aggregate lifetime savings refer to savings occurring during the lifetime of products sold in a particular year. Cumulative lifetime savings refer to all savings occurring during the lifetime of products sold between 1986 and the year being considered. Reduction in peak demand also is presented on an aggregate basis (i.e., savings from products sold that year) and cumulative basis (i.e., savings from all products sold between 1986 and the year being considered).

The electricity savings results are summarized in Table 17. By 1995, the standards are expected to reduce electricity consumption by 30.4 TWh/yr with peak summer demand reduced by 12,800 MW. By 2000, it is estimated that the standards will reduce electricity consumption by 53.5 TWh/yr and peak summer demand by 22,000 MW. Water heaters account for the largest portion of the electricity savings (39% in 2000) while CACs and HPs account for 56% of the peak demand savings. The anticipated reduction in peak demand in 2000 is equivalent to about 10% of the growth in national peak demand forecast by the utility industry during 1986-2000 [16].

The overall energy savings results (electricity and fuel) are summarized in Table 18. It is estimated that the standards will lower residential energy use by 553 TBtu (trillion Btu) in 1995 and 959 TBtu in 2000. The latter value is equal to about 6% of residential energy consumption at the present time.

Over the lifetime of products sold during 1986-2000, it is estimated that the standards will lower residential energy use by 17

Quads (quadrillion Btu). This is equivalent to over two years of energy imports at America's current net import rate. GWHs provide the greatest amount of savings (26% of the total), while R/Fs and EWHs each contribute 18% of the lifetime total for products sold by 2000. Gas furnaces and boilers provide about 16% of the lifetime energy savings.

B. Economic Savings

Tables 9-16 contain the economic savings results on a product-by-product basis. Once again, savings are viewed on both an aggregate annual and cumulative basis. Net savings are the savings in lifetime operating costs minus the estimated extra first cost as a result of imposing the efficiency standards. The benefit-cost ratio is the value of lifetime savings divided by the extra first cost for consumers. All values are expressed in 1985 dollars.

Table 19 summarizes the economic results. With the standards, consumers should realize a reduction in energy costs of $2.6 billion per year by 1995 and $4.0 billion per year by 2000. The net economic savings for consumers over the lifetime of products sold during 1986-2000 is $28.2 billion. This is nearly $300 per household. EWHs provide the most net economic savings (31% of the total), followed by GWHs (22% of the total) and R/Fs (20% of the total).

The overall benefit-cost ratio associated with the standards from the perspective of consumers is 2.7. The benefit-cost ratio is greater than 1.0 for all product types. It ranges from 1.2 for CACs to 8.7 for GWHs. The relatively low benefit-cost ratio for air conditioners is due to the substantial first cost premium associated with increasing the efficiency of this product.

It is also possible to consider the investment in utility plant that can be avoided as a result of the standards. Assuming that half the 22,000 MW of the avoided peak demand would otherwise be provided by peaking gas turbines costing $500/kW on average, half the capacity would be provided by baseload or cycling plants costing $1500/kW on average, and 8% T&D losses, the avoided investment in power generation alone is nearly $24 billion (1985 dollars). In addition, utilities will save on investments in power transmission and distribution facilities.

III. References

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14. Personal communication from the Gas Appliance Manufacturers Association, Arlington, VA, July 1986.

15. "Gas Consumption by Residential Appliances", American Gas Association, Arlington, VA, March 2, 1984.

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TABLE 1
Appliance Standards Analysis
Refrigerators - Energy Savings

Year	Sales Projec. (1000)	Market Case UEC (kWh/yr)	Stand. Case UEC (kWh/yr)	UEC Savings (kWh/yr)	Agg. Annual Savings (GWh/yr)	Cum. Annual Savings (GWh/yr)	Agg. Lifetime Savings (TWh)	Cum. Lifetime Savings (TWh)	Agg. Peak Savings (MW)	Cum. Peak Savings (MW)
1986	5367	1091	1054	37	199	199	3.77	4	27	27
1987	5438	1068	1014	54	294	492	5.58	9	39	66
1988	5511	1037	976	61	336	828	6.39	16	45	111
1989	5584	1007	939	68	380	1,208	7.21	23	51	161
1990	5658	978	903	75	424	1,632	8.06	31	57	218
1991	5734	962	850	112	642	2,275	12.20	43	86	304
1992	5810	947	800	147	854	3,129	16.23	59	114	418
1993	5887	932	754	178	1048	4,177	19.91	79	140	558
1994	5965	917	710	207	1235	5,411	23.46	103	165	723
1995	6045	902	668	234	1414	6,826	26.87	130	189	912
1996	6125	888	657	231	1415	8,241	26.88	157	189	1101
1997	6207	874	647	227	1409	9,650	26.77	183	188	1289
1998	6289	860	636	224	1409	11,058	26.77	210	188	1477
1999	6373	846	626	220	1402	12,460	26.64	237	187	1664
2000	6457	833	616	217	1401	13,862	26.62	263	187	1851

TABLE 2
Appliance Standards Analysis
Freezers - Energy Savings

Year	Sales Projec. (1000)	Market Case UEC (kWh/yr)	Stand. Case UEC (kWh/yr)	UEC Savings (kWh/yr)	Agg. Annual Savings (GWh/yr)	Cum. Annual Savings (GWh/yr)	Agg. Lifetime Savings (TWh)	Cum. Lifetime Savings (TWh)	Agg. Peak Savings (MW)	Cum. Peak Savings (MW)
1986	1395	771	735	36	50	50	1.05	1	7	7
1987	1414	758	704	54	76	127	1.60	3	10	17
1988	1432	734	675	59	85	211	1.77	4	11	28
1989	1451	710	648	62	90	301	1.89	6	12	40
1990	1471	687	621	66	97	398	2.04	8	13	52
1991	1490	676	588	88	131	529	2.75	11	17	69
1992	1510	664	557	107	162	691	3.39	15	21	91
1993	1530	653	527	126	193	884	4.05	19	25	116
1994	1551	642	499	143	222	1,105	4.66	23	29	145
1995	1571	632	473	159	250	1,355	5.25	28	33	178
1996	1592	621	465	156	248	1,604	5.22	34	33	211
1997	1613	611	457	154	248	1,852	5.22	39	33	243
1998	1635	600	449	151	247	2,099	5.18	44	32	276
1999	1656	590	442	148	245	2,344	5.15	49	32	308
2000	1678	581	434	147	247	2,591	5.18	54	32	340

TABLE 3
Appliance Standards Analysis
Electric Water Heaters - Energy Savings

Year	Sales Projec. (1000)	Market Case UEC (kWh/yr)	Stand. Case UEC (kWh/yr)	UEC Savings (kWh/yr)	Agg. Annual Savings (GWh/yr)	Cum. Annual Savings (GWh/yr)	Agg. Lifetime Savings (TWh)	Cum. Lifetime Savings (TWh)	Agg. Peak Savings (MW)	Cum. Peak Savings (MW)
1986	3173	4312	4212	100	317	317	4	4	39	39
1987	3215	4286	4090	196	630	947	8	12	78	117
1988	3258	4260	3971	289	942	1,889	12	25	116	233
1989	3301	4235	3856	379	1251	3,140	16	41	154	387
1990	3345	4209	3744	465	1556	4,696	20	61	192	579
1991	3390	4184	3722	462	1566	6,262	20	81	193	772
1992	3435	4159	3700	459	1577	7,838	20	102	194	966
1993	3480	4134	3677	457	1591	9,429	21	123	196	1162
1994	3527	4109	3655	454	1601	11,030	21	143	197	1360
1995	3574	4084	3633	451	1612	12,642	21	164	199	1559
1996	3621	4060	3612	448	1622	14,264	21	185	200	1759
1997	3669	4036	3590	446	1637	15,901	21	207	202	1960
1998	3718	4011	3568	443	1647	17,548	21	228	203	2163
1999	3768	3987	3547	440	1658	19,205	22	250	204	2368
2000	3818	3963	3526	437	1668	20,874	22	271	206	2573

TABLE 4
Appliance Standards Analysis
Room Air Conditioners - Energy Savings

Year	Sales Projec. (1000)	Market Case UEC (kWh/yr)	Stand. Case UEC (kWh/yr)	UEC Savings (kWh/yr)	Agg. Annual Savings (GWh/yr)	Cum. Annual Savings (GWh/yr)	Agg. Lifetime Savings (TWh)	Cum. Lifetime Savings (TWh)	Agg. Peak Savings (MW)	Cum. Peak Savings (MW)
1986	2658	1014	969	45	120	120	1.79	2	128	128
1987	2693	999	933	66	178	297	2.67	4	190	317
1988	2729	984	898	86	235	532	3.52	8	250	567
1989	2765	969	865	104	288	820	4.31	12	307	874
1990	2802	954	833	121	339	1,159	5.09	17	362	1,235
1991	2840	944	825	119	338	1,497	5.07	22	360	1,596
1992	2877	935	817	118	340	1,836	5.09	28	362	1,958
1993	2916	926	808	118	344	2,180	5.16	33	367	2,325
1994	2954	916	800	116	343	2,523	5.14	38	365	2,690
1995	2994	907	793	114	341	2,864	5.12	43	364	3,054
1996	3033	898	785	113	343	3,207	5.14	48	365	3,419
1997	3074	889	777	112	344	3,551	5.16	53	367	3,786
1998	3115	880	769	111	346	3,897	5.19	58	369	4,155
1999	3156	871	762	109	344	4,241	5.16	64	367	4,522
2000	3198	862	754	108	345	4,586	5.18	69	368	4,890

TABLE 5
Appliance Standards Analysis
Central Air Conditioners and Heat Pumps
Energy Savings

Year	Sales Projec. (1000)	Market Case UEC (kWh/yr)	Stand. Case UEC (kWh/yr)	UEC Savings (kWh/yr)	Agg. Annual Savings (GWh/yr)	Cum. Annual Savings (GWh/yr)	Agg. Lifetime Savings (TWh)	Cum. Lifetime Savings (TWh)	Agg. Peak Savings (MW)	Cum. Peak Savings (MW)
1986	2686	2956	2905	51	137	137	2	2	146	146
1987	2722	2912	2814	98	267	404	3	5	284	430
1988	2758	2869	2725	144	397	801	5	10	423	854
1989	2795	2827	2639	188	525	1,326	6	16	560	1,414
1990	2832	2785	2556	229	648	1,975	8	24	691	2,105
1991	2869	2757	2475	282	809	2,784	10	33	863	2,968
1992	2908	2730	2397	333	968	3,752	12	45	1032	4,001
1993	2946	2703	2373	330	972	4,724	12	57	1037	5,037
1994	2985	2676	2350	326	973	5,698	12	68	1038	6,075
1995	3025	2650	2326	324	980	6,678	12	80	1045	7,120
1996	3065	2624	2303	321	984	7,662	12	92	1049	8,169
1997	3106	2598	2281	317	985	8,646	12	104	1050	9,219
1998	3147	2572	2258	314	988	9,635	12	116	1054	10,273
1999	3189	2546	2236	310	989	10,623	12	127	1054	11,327
2000	3232	2521	2214	307	992	11,616	12	139	1058	12,385

TABLE 6
Appliance Standards Analysis
Gas Furnaces and Boilers - Energy Savings

Year	Sales Projec. (1000)	Market Case UEC (MBtu/yr)	Stand. Case UEC (MBtu/yr)	UEC Savings (MBtu/yr)	Agg. Annual Savings (TBtu/yr)	Cum. Annual Savings (TBtu/yr)	Agg. Lifetime Savings (TBtu)	Cum. Lifetime Savings (Quads)
1986	1821	60.50	59.80	0.70	1.27	1.27	29	0.03
1987	1845	59.90	58.50	1.40	2.58	3.86	59	0.09
1988	1870	59.30	57.20	2.10	3.93	7.78	90	0.18
1989	1895	58.70	56.00	2.70	5.12	12.90	118	0.30
1990	1920	58.10	54.80	3.30	6.34	19.24	146	0.44
1991	1945	57.80	53.60	4.20	8.17	27.41	188	0.63
1992	1971	57.50	52.40	5.10	10.05	37.46	231	0.86
1993	1997	57.20	52.10	5.10	10.19	47.65	234	1.10
1994	2024	56.90	51.80	5.10	10.32	57.97	237	1.33
1995	2051	56.70	51.60	5.10	10.46	68.43	241	1.57
1996	2078	56.40	51.30	5.10	10.60	79.03	244	1.82
1997	2106	56.10	51.10	5.00	10.53	89.56	242	2.06
1998	2134	55.80	50.80	5.00	10.67	100.23	245	2.31
1999	2162	55.50	50.60	4.90	10.59	110.82	244	2.55
2000	2191	55.30	50.30	5.00	10.96	121.78	252	2.80

TABLE 7
Appliance Standards Analysis
Gas Water Heaters - Energy Savings

Year	Sales Projec. (1000)	Market Case UEC (MBtu/yr)	Stand. Case UEC (MBtu/yr)	UEC Savings (MBtu/yr)	Agg. Annual Savings (TBtu/yr)	Cum. Annual Savings (TBtu/yr)	Agg. Lifetime Savings (TBtu)	Cum. Lifetime Savings (Quads)
1986	3288	27.40	26.50	0.90	2.96	2.96	68	0.07
1987	3332	27.30	25.60	1.70	5.66	8.62	130	0.20
1988	3376	27.20	24.60	2.60	8.78	17.40	202	0.40
1989	3421	27.10	23.70	3.40	11.63	29.03	268	0.67
1990	3466	26.90	22.90	4.00	13.87	42.90	319	0.99
1991	3513	26.80	22.80	4.00	14.05	56.95	323	1.31
1992	3559	26.70	22.70	4.00	14.24	71.19	327	1.64
1993	3607	26.60	22.60	4.00	14.43	85.61	332	1.97
1994	3655	26.50	22.50	4.00	14.62	100.23	336	2.31
1995	3703	26.40	22.40	4.00	14.81	115.04	341	2.65
1996	3752	26.30	22.40	3.90	14.63	129.68	337	2.98
1997	3802	26.20	22.30	3.90	14.83	144.51	341	3.32
1998	3853	26.10	22.20	3.90	15.03	159.53	346	3.67
1999	3904	26.00	22.10	3.90	15.23	174.76	350	4.02
2000	3956	25.90	22.00	3.90	15.43	190.19	355	4.37

TABLE 8
Appliance Standards Analysis
Gas Ranges - Energy Savings

Year	Sales Projec. (1000)	Market Case UEC (MBtu/yr)	Stand. Case UEC (MBtu/yr)	UEC Savings (MBtu/yr)	Agg. Annual Savings (TBtu/yr)	Cum. Annual Savings (TBtu/yr)	Agg. Lifetime Savings (TBtu)	Cum. Lifetime Savings (Quads)
1986	1665	6.16	5.00	1.16	1.93	1.93	44	0.04
1987	1687	6.16	5.00	1.16	1.96	3.89	45	0.09
1988	1710	6.16	5.00	1.16	1.98	5.87	46	0.14
1989	1732	6.16	5.00	1.16	2.01	7.88	46	0.18
1990	1755	6.16	5.00	1.16	2.04	9.92	47	0.23
1991	1779	6.16	5.00	1.16	2.06	11.98	47	0.28
1992	1802	6.16	5.00	1.16	2.09	14.07	48	0.32
1993	1826	6.16	5.00	1.16	2.12	16.19	49	0.37
1994	1851	6.16	5.00	1.16	2.15	18.34	49	0.42
1995	1875	6.16	5.00	1.16	2.18	20.51	50	0.47
1996	1900	6.16	5.00	1.16	2.20	22.72	51	0.52
1997	1925	6.16	5.00	1.16	2.23	24.95	51	0.57
1998	1951	6.16	5.00	1.16	2.26	27.21	52	0.63
1999	1977	6.16	5.00	1.16	2.29	29.51	53	0.68
2000	2003	6.16	5.00	1.16	2.32	31.83	53	0.73

TABLE 9
Appliance Standards Analysis
Refrigerators - Economic Savings

Year	Value Agg. An. Savings (10^6 $)	Value Cum. An. Savings (10^6 $)	Value Lifetime Savings (10^6 $)	Unit Extra First Cost ($)	Agg. Extra First Cost (10^6 $)	Net Agg. Savings (10^6 $)	Net Cum. Savings (10^6 $)	Benefit-Cost Ratio
1986	15	15	178	10	53	125	125	3.37
1987	21	36	251	14	75	177	302	3.37
1988	23	58	274	15	81	193	495	3.37
1989	24	83	295	16	87	207	702	3.37
1990	26	108	314	16	93	220	922	3.37
1991	37	146	452	23	134	318	1240	3.37
1992	47	193	572	29	170	402	1642	3.37
1993	55	249	669	34	199	470	2112	3.37
1994	62	311	751	37	223	528	2640	3.37
1995	68	378	819	40	243	576	3216	3.37
1996	65	443	780	38	232	548	3764	3.37
1997	61	504	740	35	220	520	4285	3.37
1998	58	562	705	33	209	495	4780	3.37
1999	55	618	668	31	198	469	5249	3.37
2000	53	670	636	29	189	447	5696	3.37

TABLE 10
Appliance Standards Analysis
Freezers - Economic Savings

Year	Value Agg. An. Savings (10^6 $)	Value Cum. An. Savings (10^6 $)	Value Lifetime Savings (10^6 $)	Unit Extra First Cost ($)	Agg. Extra First Cost (10^6 $)	Net Agg. Savings (10^6 $)	Net Cum. Savings (10^6 $)	Benefit-Cost Ratio
1986	4	4	48	6	8	40	40	5.88
1987	5	9	69	8	12	57	97	5.88
1988	6	15	73	9	12	61	158	5.88
1989	6	21	74	9	13	61	219	5.88
1990	6	27	76	9	13	63	282	5.88
1991	8	34	98	11	17	81	364	5.88
1992	9	43	115	13	20	95	459	5.88
1993	10	53	130	14	22	108	567	5.88
1994	11	64	143	16	24	119	686	5.88
1995	12	76	153	17	26	127	813	5.88
1996	11	88	145	16	25	121	934	5.88
1997	11	99	138	15	24	115	1048	5.88
1998	10	109	131	14	22	109	1157	5.88
1999	10	118	124	13	21	103	1260	5.88
2000	9	128	119	12	20	99	1358	5.88

TABLE 11
Appliance Standards Analysis
Electric Water Heaters - Economic Savings

Year	Value Agg. An. Savings (10^6 $)	Value Cum. An. Savings (10^6 $)	Value Lifetime Savings (10^6 $)	Unit Extra First Cost ($)	Agg. Extra First Cost (10^6 $)	Net Agg. Savings (10^6 $)	Net Cum. Savings (10^6 $)	Benefit-Cost Ratio
1986	24	24	221	9	27	194	194	8.14
1987	45	68	419	16	51	367	561	8.14
1988	63	132	596	22	73	523	1084	8.14
1989	80	212	754	28	93	661	1745	8.14
1990	95	307	893	33	110	783	2528	8.14
1991	91	398	856	31	105	751	3279	8.14
1992	87	485	821	29	101	720	3999	8.14
1993	84	569	788	28	97	692	4690	8.14
1994	81	650	756	26	93	663	5353	8.14
1995	77	727	725	25	89	636	5989	8.14
1996	74	801	695	24	85	609	6598	8.14
1997	71	872	667	22	82	585	7184	8.14
1998	68	940	640	21	79	561	7745	8.14
1999	65	1006	613	20	75	538	8283	8.14
2000	63	1068	588	19	72	516	8798	8.14

TABLE 12
Appliance Standards Analysis
Room Air Conditioners - Economic Savings

Year	Value Agg. An. Savings (10^6 $)	Value Cum. An. Savings (10^6 $)	Value Lifetime Savings (10^6 $)	Unit Extra First Cost ($)	Agg. Extra First Cost (10^6 $)	Net Agg. Savings (10^6 $)	Net Cum. Savings (10^6 $)	Benefit-Cost Ratio
1986	9	9	92	23	60	32	32	1.53
1987	13	21	131	32	85	45	77	1.53
1988	16	37	164	39	107	57	134	1.53
1989	18	56	192	45	125	66	200	1.53
1990	21	76	215	50	141	74	274	1.53
1991	20	96	204	47	134	71	345	1.53
1992	19	115	195	44	128	67	412	1.53
1993	18	133	189	42	123	65	477	1.53
1994	17	150	179	40	117	62	539	1.53
1995	16	167	170	37	111	59	598	1.53
1996	16	182	162	35	106	56	654	1.53
1997	15	197	155	33	102	54	707	1.53
1998	14	212	148	31	97	51	758	1.53
1999	14	225	141	29	92	49	807	1.53
2000	13	238	135	28	88	46	854	1.53

TABLE 13
Appliance Standards Analysis
Central Air Conditioners and Heat Pumps
Economic Savings

Year	Value Agg. An. Savings (10^6 $)	Value Cum. An. Savings (10^6 $)	Value Lifetime Savings (10^6 $)	Unit Extra First Cost ($)	Agg. Extra First Cost (10^6 $)	Net Agg. Savings (10^6 $)	Net Cum. Savings (10^6 $)	Benefit-Cost Ratio
1986	10	10	90	28	76	14	14	1.19
1987	19	29	167	52	140	27	41	1.19
1988	27	56	237	72	199	38	79	1.19
1989	34	90	299	90	251	48	127	1.19
1990	40	129	351	104	295	56	184	1.19
1991	47	176	417	122	350	67	251	1.19
1992	54	230	476	137	399	76	327	1.19
1993	51	281	455	130	382	73	401	1.19
1994	49	330	434	122	364	70	470	1.19
1995	47	377	416	115	349	67	537	1.19
1996	45	422	398	109	334	64	601	1.19
1997	43	465	379	102	318	61	662	1.19
1998	41	506	362	97	304	58	720	1.19
1999	39	545	345	91	290	55	776	1.19
2000	37	582	330	86	277	53	829	1.19

TABLE 14
Appliance Standards Analysis
Gas Furnaces and Boilers - Economic Savings

Year	Value Agg. An. Savings (10^6 $)	Value Cum. An. Savings (10^6 $)	Value Lifetime Savings (10^6 $)	Unit Extra First Cost ($)	Agg. Extra First Cost (10^6 $)	Net Agg. Savings (10^6 $)	Net Cum. Savings (10^6 $)	Benefit-Cost Ratio
1986	7	7	99	29	52	47	47	1.90
1987	14	22	192	55	101	91	138	1.90
1988	21	42	277	78	146	131	269	1.90
1989	26	68	344	96	181	163	432	1.90
1990	30	98	406	111	213	192	625	1.90
1991	37	135	498	135	262	236	861	1.90
1992	43	178	584	156	307	277	1138	1.90
1993	42	220	564	148	296	267	1405	1.90
1994	40	260	544	141	286	258	1663	1.90
1995	39	299	525	135	276	249	1912	1.90
1996	38	337	507	128	266	240	2152	1.90
1997	36	372	479	120	252	227	2379	1.90
1998	34	406	463	114	243	219	2598	1.90
1999	32	439	437	106	230	207	2806	1.90
2000	32	471	431	103	227	204	3010	1.90

TABLE 15
Appliance Standards Analysis
Gas Water Heaters - Economic Savings

Year	Value Agg. An. Savings (10^6 $)	Value Cum. An. Savings (10^6 $)	Value Lifetime Savings (10^6 $)	Unit Extra First Cost ($)	Agg. Extra First Cost (10^6 $)	Net Agg. Savings (10^6 $)	Net Cum. Savings (10^6 $)	Benefit-Cost Ratio
1986	17	17	160	6	18	142	142	8.67
1987	31	48	292	10	34	259	401	8.67
1988	46	94	431	15	50	382	782	8.67
1989	58	152	545	18	63	482	1264	8.67
1990	66	218	618	21	71	547	1811	8.67
1991	64	282	597	20	69	528	2339	8.67
1992	61	343	576	19	66	509	2848	8.67
1993	59	402	556	18	64	492	3340	8.67
1994	57	459	536	17	62	474	3814	8.67
1995	55	514	517	16	60	458	4272	8.67
1996	52	566	487	15	56	431	4703	8.67
1997	50	616	470	14	54	416	5118	8.67
1998	48	664	453	14	52	401	5520	8.67
1999	47	711	438	13	50	387	5907	8.67
2000	45	756	422	12	49	374	6280	8.67

TABLE 16
Appliance Standards Analysis
Gas Ranges - Economic Savings

Year	Value Agg. An. Savings (10^6 $)	Value Cum. An. Savings (10^6 $)	Value Lifetime Savings (10^6 $)	Unit Extra First Cost ($)	Agg. Extra First Cost (10^6 $)	Net Agg. Savings (10^6 $)	Net Cum. Savings (10^6 $)	Benefit-Cost Ratio
1986	11	11	130	11	18	112	112	7.09
1987	11	22	126	11	18	108	220	7.09
1988	10	32	121	10	17	104	324	7.09
1989	10	42	117	10	17	101	425	7.09
1990	10	52	113	9	16	97	522	7.09
1991	9	61	109	9	15	94	616	7.09
1992	9	70	105	8	15	90	707	7.09
1993	9	79	102	8	14	87	794	7.09
1994	8	87	98	7	14	84	878	7.09
1995	8	95	95	7	13	81	960	7.09
1996	8	103	91	7	13	78	1038	7.09
1997	8	111	88	6	12	76	1114	7.09
1998	7	118	85	6	12	73	1187	7.09
1999	7	125	82	6	12	71	1257	7.09
2000	7	132	79	6	11	68	1325	7.09

TABLE 17
Appliance Standards Analysis
Electricity Savings Summary

	Savings by 1995			Savings by 2000		
Product	Annual (TWh/yr)	Lifetime (TWh)	Peak (MW)	Annual (TWh/yr)	Lifetime (TWh)	Peak (MW)
Refrig	6.83	130	912	13.86	263	1,851
Freezer	1.36	28	178	2.59	54	340
Wat. Ht.	12.64	164	1,559	20.87	271	2,573
Room AC	2.86	43	3,054	4.59	69	4,890
Cent. AC	6.68	80	7,120	11.62	139	12,385
TOTAL	30.37	445	12,823	53.53	796	22,039

TABLE 18
Appliance Standards Analysis
Energy Savings Summary

Product	Savings by 1995 Annual (TBtu/yr)	Savings by 1995 Lifetime (Quads)	Savings by 2000 Annual (TBtu/yr)	Savings by 2000 Lifetime (Quads)
Refrig	78.55	1.50	159.39	3.02
Freezer	15.64	0.32	29.79	0.62
El. WH	145.36	1.89	240.01	3.12
Room AC	32.89	0.49	52.79	0.79
Cent. AC	76.82	0.92	133.63	1.60
Furnace	68.43	1.57	121.78	2.80
Gas WH	115.04	2.65	190.19	4.37
Gas range	20.51	0.47	31.83	0.73
TOTAL	553.24	9.81	959.40	17.05

TABLE 19
Appliance Standards Analysis
Economic Savings Summary

Product	Savings by 1995 Annual Operation (10^6 $)	Net Lifetime (10^6 $)	Benefit-Cost Ratio	Savings by 2000 Annual Operation (10^6 $)	Net Lifetime (10^6 $)	Benefit-Cost Ratio
Refrig	378	3,216	3.37	670	5,696	3.37
Freezer	76	813	5.88	128	1,358	5.88
El. WH	727	5,989	8.14	1,068	8,798	8.14
Room AC	167	598	1.53	238	854	1.53
Cent. AC	377	537	1.19	582	829	1.19
Furnace	299	1,912	1.90	471	3,010	1.90
Gas WH	514	4,272	8.67	756	6,280	8.67
Gas range	95	960	7.09	132	1,325	7.09
TOTAL	2,633	18,297	2.69	4,045	28,150	2.69

APPENDIX A

REFRIGERATOR AND FREEZER ENERGY CONSERVATION STANDARDS
Effective January 1, 1990

	Energy Standards Equations	For Example	
		Adjusted Volume	kwh/yr
(A) Refrigerators and Refrigerator-Freezers with manual defrost	16.3 AV + 316	12.8	525
(B) Refrigerator-Freezers - partial automatic defrost	21.8 AV + 429	15.2	760
(C) Refrigerator-Freezers - automatic defrost with:			
(i) Top mounted freezer without ice	23.5 AV + 471	20.4	950
(ii) Side mounted freezer without ice	27.7 AV + 488	24.8	1175
(iii) Bottom mounted freezer without ice	27.7 AV + 488	24.8	1175
(iv) Top mounted freezer with through the door ice service	26.4 AV + 535	25.8	1216
(v) Side mounted freezer with through the door ice	30.9 AV + 547	28.4	1425
(D) Upright Freezers with:			
(i) Manual defrost	10.9 AV + 422	26.9	715
(ii) Automatic defrost	16.0 AV + 623	29.8	1100
(E) Chest Freezers and all other freezers	14.8 AV + 223	23.8	575

"AV" is the adjusted volume as defined in the test procedure under Section 323. These standards do not apply to refrigerator-freezers with total refrigerated volume exceeding 39 cubic feet or freezers with total refrigerated volume exceeding 30 cubic feet.

The average energy use for all refrigerators is 976 kwh/yr and for freezers is 671 kwh/yr.

ROOM AIR CONDITIONER STANDARDS
Effective January 1, 1990

Product Class	EER
Without Reverse Cycle and With Louvered Sides	
Less than 6,000 Btu	8.0
6,000 to 7,999 Btu	8.5
8,000 to 13,999 Btu	9.0
14,000 to 19,999 Btu	8.8
20,000 Btu+	8.2
Without Reverse Cycle and Without Louvered Sides	
Less than 6,000 Btu	8.0
6,000 to 7,999 Btu	8.5
8,000 to 13,999 Btu	8.5
14,000 to 19,999 Btu	8.5
20,000 Btu +	8.2
With Reverse Cycle and With Louvered Sides	8.5
With Reverse Cycle, Without Louvered Sides	8.0
AVERAGE: EER	8.6

Earliest date for revised federal standards or state regulation which is granted waivers. -- January 1, 1995.

CENTRAL AIR CONDITIONER AND CENTRAL AIR CONDITIONING HEAT PUMP STANDARDS

Split Systems:	10.0 SEER - Effective January 1, 1992
Single Package Systems:	9.7 SEER - Effective January 1, 1993

Earliest date for revised federal standards or state standards which are granted waiver -- January 1, 1999.

WATER HEATER STANDARDS

Effective January 1, 1990

Gas:	.62 - (.0019) Rated Storage Volume
Oil:	.59 - (.0019) Rated Storage Volume
Electric:	.95 - (.00132) Rated Storage Volume

Earliest date for revised federal standard or state standard which is granted waiver -- January 1, 1995

FURNACE STANDARDS

Effective January 1, 1992, furnaces shall have an AFUE of not less than 78%, except for gas steam boilers which shall have an AFUE of not less than 68%. Earliest date for revision or state standards which receive waivers -- January 1, 2002.

Effective January 1, 1990, mobile home furnaces shall have an AFUE of not less than 75%. Earliest date for revision or state standards which receive waivers -- January 1, 1995.

DISHWASHER STANDARD

Effective January 1, 1988 dishwashers shall be equipped with an option to dry without heat. Earliest date for revision or state standards which receive waivers -- January 1, 1993.

CLOTHES WASHER STANDARD

Effective January 1, 1988 all rinse cycles shall include unheated water but may have a heated water rinse option. Earliest date for revision or state standards which receive waivers -- January 1, 1993.

CLOTHES DRYER STANDARD

Effective January 1, 1988 clothes dryers shall not be equipped with a constant burning pilot. Earliest date for revision or state standards which receive waivers -- January 1, 1993.

DIRECT HEATING EQUIPMENT STANDARDS

Effective January 1, 1990, efficiencies of gas direct heating equipment shall not be less than the following:

Wall	
Fan Type	
Up to 42,000 Btu/hour	73% AFUE
Over 42,000 Btu/hour	74% AFUE
Gravity Type	
Up to 10,000 Btu/hour	59% AFUE
Over 10,000 Btu/hour up to 12,000 Btu/hour	60% AFUE
Over 12,000 Btu/hour up to 15,000 Btu/hour	61% AFUE
Over 15,000 Btu/hour up to 19,000 Btu/hour	62% AFUE
Over 19,000 Btu/hour up to 27,000 Btu/hour	63% AFUE
Over 27,000 Btu/hour up to 46,000 Btu/hour	64% AFUE
Over 46,000 Btu/hour	65% AFUE
Floor	
Up to 37,000 Btu/hour	56% AFUE
Over 37,000 Btu/hour	57% AFUE
Room	
Up to 18,000 Btu/hour	57% AFUE
Over 18,000 Btu/hour up to 20,000 Btu/hour	58% AFUE
Over 20,000 Btu/hour up to 27,000 Btu/hour	63% AFUE
Over 27,000 Btu/hour up to 46,000 Btu/hour	64% AFUE
Over 46,000 Btu/hour	65% AFUE

Earliest date for revision or state standards which receive waivers -- January 1, 1995.

KITCHEN RANGE AND OVEN STANDARD

Effective January 1, 1990, gas kitchen ranges and ovens having an electrical supply cord shall not be equipped with a constant burning pilot. Earliest possible date for revision or state standards which receive waivers -- January 1, 1995.

POOL HEATERS

Effective January 1, 1990, the thermal efficiency of pool heaters shall not be less than 78%. Earliest date for revision or state standards which receive waivers -- January 1, 1995.

Senator EVANS. Thank you very much.
Mr. Butler.

STATEMENT OF WILLIAM A. BUTLER, VICE PRESIDENT AND COUNSEL, NATIONAL AUDUBON SOCIETY

Mr. BUTLER. Thank you, Mr. Chairman. My name is William Butler. I am vice president for Government relations and counsel for the National Audubon Society. Audubon is a national environmental group with approximately 550,000 members nationally. In addition to our home office in New York and our office in Washington, we have approximately 15 regional offices across the country. We have over 500 chapters, nearly 100 sanctuaries and several nature centers and camps.

Energy efficiency and conservation have always been an important priority of the National Audubon Society and this includes appliance standards. It was at the State level that National Audubon became involved in the appliance issue. As a followup to our 1984 energy plan we decided to make enactment of State appliance efficiency standards the focus of our legislative efforts on energy, beginning with New York State.

A series of meetings with the New York State Energy Office led to the Cuomo administration introducing a bill into the legislature to strengthen New York's existing standards. Along with Audubon, a coalition of groups has been active in supporting the New York bill, including the Sierra Club and the New York-based Environmental Planning Lobby.

Now, skipping on the first page: Prior to learning of the compromise negotiated by NRDC and the appliance manufacturers that has led to S. 2781, National Audubon was poised on the brink of moving to other States, particularly Texas and Colorado. The Legislative Drafting Research Fund of Columbia University Law School has prepared for us a model State bill and supporting memorandum that were to be circulated to State legislatures by Audubon members around the country.

Should the current national bill be enacted by Congress this session, there will be no need for us to proceed with our State campaign. I have provided a copy of our model State bill for the record. It will be useful in demonstrating to the committee where the compromises have been made in S. 2781.

Now, moving to the next page, page 2: However, despite our efforts at the State level, we prefer a national bill and strongly endorse the current proposal to amend NECPA with respect to energy standards for appliances. We endorse the bill, but we are not happy with all of its provisions. It is definitely a compromise from our perspective, and I will not summarize where we think that the bill is weaker than we would like to see it, but let it suffice to say that this is a compromise bill, and just as the manufacturers have suggested that they would conceivably be happier if left to their own devices, so too we think that a stronger bill would be our preference but one does not get all that one wishes in a compromise.

Skipping over the next page in the testimony to page 4, justification for specifying numerical standards in S. 2781: This was the issue which drew the most question in the House, so I propose to go into it in some little detail.

There are two reasons for specifying numerical values for interim standards in S. 2781 rather than relying on the Department of Energy to interpret qualitative criteria specified by Congress. I might say this is in addition to the arguments that an administrative proceeding would be costly and time consuming that have been made by several other witnesses here today.

First, the Department of Energy has proved itself to be so antagonistic to the concept of congressionally mandated standards that it concocted a "no standard" standard to get around congressional intent, an action that the D.C. Circuit Court of Appeals found to be unsupported by substantial evidence and contrary to law, as you have summarized for us.

The best way for Congress to ensure that DOE overcomes its reluctance to enact standards is to specify precise energy efficiency standards. The second reason for Congress to include numerical values for interim standards is that S. 2781 is the result of a political compromise, not the outcome of a technical proceeding.

The Congress is the best judge of the wisdom of adopting a compromise, not an administrative agency such as DOE. A voluminous record has been established in Federal and State proceedings that attests to the difference in opinion among appliance manufacturers, State governments, and energy conservation advocates concerning the economic justification and technical feasibility of a wide range of possible standards. A compromise is clearly in order.

If this bill is not passed this session, groups like National Audubon will have no choice but to return to State legislatures, seeking the enactment of State appliance standards. The fragile coalition that support S. 2781 may fall apart in the next session of Congress as a number of States try to get an appliance bill passed before they can be preempted.

With the battle shifting back to the States, a tremendous waste of energy on both sides, the controversy will ensue as the same battles are fought over and over again in all of the States that have large populations.

We urge you to spare us such political bloodshed by passing the present bill.

Moving to the last page, savings from the proposed bill: You have heard from previous witnesses as to savings. I will simply summarize here. Using the Audubon energy computer model, our staff has made a preliminary analysis of the energy and dollar savings that can be expected from S. 2781. Under a traditional modeling scenario, one in which the appliance market is assumed to follow DOE models, significant energy and dollar savings result by the year 2005. The equivalent of four to eight large 1,000-megawatt powerplants is eliminated and customers accumulate a net savings of electricity costs of $13 to $26 billion.

I will not go into the footnoted material which highlights wherever there are minor differences between our calculations and those of the previous witnesses, but let it suffice to say that we are in the same ballpark in terms of savings here.

In conclusion, in S. 2781 the Congress has an opportunity to resolve a longstanding conflict over appliance standards now that the major adversaries have reached a compromise. This is one of those rare occasions—and you have summarized how rare this is—when most everyone wins. Consumers will save money, environmentalists will be sure that four to eight fewer powerplants will be operating in 2005, and appliance manufacturers will be protected from economic balkanization and the possibility of many different sets of efficiency standards.

Would that we could reach such a consensus on other energy and environmental disputes. Thank you very much.

[The prepared statement of Mr. Butler follows:]

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Statement

of

William A. Butler

Vice President and Counsel

National Audubon Society

Before the

Senate Committee on Energy and Natural Resources

in Support of S. 2781

The National Appliance Energy Conservation Act of 1986

September 16, 1986

It was at the state level that National Audubon became involved in the appliance issue. As a follow-up to our 1984 Energy Plan, we decided to make enactment of state appliance efficiency standards the focus of our legislative efforts on energy, beginning with New York State. A series of meetings with the New York State Energy Office led to the Cuomo Administration introducing a bill into the Legislature to strengthen New York's existing standards. Along with Audubon, a coalition of groups has been active in supporting the New York bill, including the Sierra Club and the New York-based Environmental Planning Lobby.

Massachusetts Audubon played a role in Massachusetts similar to the role played by National Audubon in New York State, stimulating an appliance bill that is now under consideration by the legislature. Representative Larry Alexander, Senator Nicholas Costello, and Energy Secretary Sharon Pollard have played major roles in promoting the legislation. New England Electric has also been a strong supporter of the bill.

Prior to learning of the compromise negotiated by NRDC and the appliance manufacturers that has led to S. 2781, National Audubon was poised on the brink of moving to other states, particularly Texas and Colorado. The Legislative Drafting Research Fund of Columbia University Law School has prepared for us a model state bill and supporting memorandum that were to be circulated to state legislatures by Audubon members around the country. Should the current national bill be enacted by Congress this session, there will be no need for us to proceed with our state campaign.

I have provided a copy of our model state bill for the record. It will be useful in demonstrating to the Committee where the compromises have been made in S. 2781. (I have not attached the supporting legal memorandum. Copies can be obtained from my office.)

Government interest in appliance efficiency standards is long standing. Congress authorized national standards as part of the 1978 National Energy Conservation Policy Act (NECPA), and a number of states have enacted, or are considering enacting, their own standards in one form or another. Environmental groups (led by NRDC), have been at the forefront of the drive to promote appliance standards. Efficient appliances mean that less air pollution will be released from home furnaces, less acid-rain will be generated by electric utilities, and less nuclear waste will be produced that some day may escape to the environment.

The National Audubon Society has been active in the drive to enact state appliance standards, particularly in New York State. We have commissioned the drafting of a model state appliance bill and have begun to circulate it to legislators in states where we have found strong interest. However, despite our efforts at the state level, we prefer a national bill and strongly endorse the current proposal to amend NECPA with respect to energy standards for appliances. We endorse the bill, but we are not happy with all of its provisions. It is definitely a compromise from our perspective:

1) there is a significant delay before the interim standards in the bill go into effect. (We believe that most of the proposed standards could go into effect by 1986 and need not be delayed to the 1990-93 period specified in S. 2761[1].)

2) the interim standards for refrigerators and refrigerator/freezers are much weaker than the standards in the model state bill that we are circulating. (For instance, according to S. 2761, minimum standards for a typical 17 cubic foot refrigerator/freezer are 670 kilowatt-hours per year, whereas we are promoting a minimum value of 620 kilowatt-hours per year--a value that is easily justifiable on economic grounds.[2])

3) the provisions included for revising the interim standards are not strong enough to ensure that the Department of Energy will tighten standards in the years ahead to the extent that state governments might.[3]

4) unlike the bill that we are circulating, there is no provision prohibiting inefficient types of "ballasts" for fluorescent lights. (We hope that such regulations, which by themselves could increase the electricity savings projected for S. 2781 by 50%, will be taken up by this committee at a future date.[4])

Nevertheless, we endorse the compromise bill because

1) we support the concept of negotiation to resolve environmental disputes and this bill is a product of negotiations among the interested parties; and

2) we do not relish a protracted struggle at the state level with appliance manufacturers. (We've learred that they are pretty good lobbyists.)

Origins of the Current Compromise.

The journey to meaningful appliance standards has not been an easy one. The biggest roadblock has been the Department of Energy's ruling that only zero-level standards were justifiable under NECPA. And even though the Courts have ordered DOE to reconsider its decision, the prospects under existing law for obtaining national standards from DOE comparable to S. 2781 are rather weak. (Rather than discuss in my statement the conflicts that have arisen over NECPA, I have brought with me an article, commissioned by Audubon, that covers the legal history.[5])

While the legal drama over challenges to DOE's interpretation of NECPA was being played out in the courts, political activity shifted to the states. California enacted the toughest standards in the nation, whereas legislators in states such as Oregon and Florida were unable to overcome the arguments of appliance manufactures against standards, despite able assistance in Oregon from the Solar Energy Association and individual efforts of people like Barney Capehart in Florida.

Justification for Specifying Numerical Standards in S. 2781

There are two reasons for specifying numerical values for interim standards in S. 2781, rather than relying on the Department of Energy to interpret qualitative criteria specified by Congress. First, the Department of Energy has proved itself to be so antagonistic to the concept of congressionally-mandated standards that it concocted a "no-standard" standard to get around congressional intent--an action that the D.C. Circuit Court found to be unsupported by substantial evidence and contrary to law.[6] The best way for Congress to ensure that DOE overcomes its reluctance to enact standards is to specify precise energy efficiency standards.

The second reason for Congress to include numerical values for interim standards is that S. 2781 is the result of a political compromise, not the outcome of a technical proceeding. The Congress is the best judge of the wisdom of adopting a compromise, not an administrative agency such as DOE.

A voluminous record has been established in federal and state proceedings that attests to the differences in opinion among appliance manufacturers, state governments, and energy conservation advocates concerning the economic justification and technical feasibility of a wide range of possible standards. A compromise is clearly in order.

If this bill is not passed this session, groups like National Audubon will have no choice but to return to state legislatures seeking the enactment of state appliance standards. The fragile coalition that supports S. 2781 will likely fall apart in the next session of Congress as a number of states try to get an appliance bill passed before they can be preempted. With the battle shifted back to the states, a tremendous waste of energy on both sides of the controversy will ensue as the same battles are fought over and over again in all of the states that have large populations.

We urge you to spare us such political bloodshed by passing S. 2781!

Savings From the Proposed Bill.

Using the Audubon Energy Computer Model,[7] our staff has made a preliminary analysis of the energy and dollar savings that can be expected from S. 2781. Under a traditional modeling scenario, one in which the appliance market is assumed to follow DOE models, significant energy and dollar savings result by the year 2005. The equivalent of 4 to 6 large, 1000-megawatt power plants is eliminated and customers accumulate a net savings in electricity costs of 13 to 26 billion dollars.[8,9] However, under an alternate scenario, one in which efficient Japanese appliances are assumed to enter markets now dominated by U.S manufacturers, the pressure of competition obviates the need for S. 2781. Thus, the major advantage of the bill is that the country gets a guarantee that 4 to 6 fewer power plants will be needed, regardless of whether or not the Japanese make a major effort to compete head-to-head in the U.S. appliance market.

Conclusion

In S. 2781, the Congress has an opportunity to resolve a long-standing conflict over appliance standards, now that the major adversaries have reached a compromise. This is one of those rare occasions when most everyone wins. Consumers will save money. Environmentalists will be sure that 4 to 6 fewer power plants will be operating in 2005. And appliance manufacturers will be protected from economic balkanization and the possibility of many different sets of efficiency standards. Would that we could reach such a consensus on other energy and environmental disputes!

Footnotes

1) For instance, S. 2761 mandates the following dates on which standards are to go into effect: A) January 1, 1990 for Refrigerators, Refrigerator-Freezers, Freezers, Room Air Conditioners, Water Heaters, and Direct Heating Equipment [Sec. 5 (b,c,e)]. B) January 1, 1992 for Furnaces [Sec. 5 (f)]. C) January 1, 1992 or January 1993 for central air conditioners, depending on type [Sec. 5 (d)].

2) In our model bill, the 620 kwh/yr standard would take effect on January 1, 1992. Economic justification for the standards that we recommend is based on a careful review of the literature performed by Audubon Staff and described in, Rollins and Beyea, "U.S. Appliance Efficiency Standards," *Energy Policy*, October 1985.

3) Although S. 2761, in Sec. 5 (j), gives more guidance to DOE on the meaning of "economically justifiable standards" than in present law, we do not believe the changes are sufficient to overcome the resistance in DOE to setting standards of the magnitude advocated by New York and California.

4) The savings from efficient ballasts come primarily in the commercial sector. Note that about 12% of U.S. electricity consumption goes for fluorescent lighting [S. Berman, "Energy and Lighting," *Energy Sources: Conservation and Renewables*, American Institute of Physics, New York, pp. 247-249, (1985)]. High-frequency, solid state ballasts raise typical "efficacies" from 60 lumens/watt to 90 lumens/watt [ibid, p. 251], suggesting that the proposed regulations prohibiting inefficient ballasts would save about 10% of the electricity used in fluorescent lighting, that is 1.2% of U.S. electricity consumption.

5) The article has been reprinted from a special issue of the *Columbia Journal of Environmental Law* devoted to legal issues arising from the 1984 *Audubon Energy Plan*. [R. Alta Charo, Lisa R. Stearns, and Michael Case, "Overview of Legal Issues Arising in Development of Federal and State Appliance Efficiency Standards," *Columbia Journal of Environmental Law*, Vol. 11, No. 2, pp. 315-353 (1986).]

6) Natural Resources Defense Council v. Herrington, 768 F.2d 1364 (D.C. Cir. 1985) (Cir. Case No. 83-1195, and consolidated cases 83-2126, 83-2313, and 84-1055).

7) Audubon's energy model is discussed in Volumes I and II of the *Audubon Energy Plan*, National Audubon Society, New York, 1984. It is also discussed in L. Medsker, J. Beyea, and T. Lyons, "Computer Modeling for Energy Policy Analysis," *Proceedings of the 15th Annual Modeling and Simulation Conference*, Pittsburgh, PA, 15, Part 3, p. 1111 (1984); and, L. Medsker, "An Interactive Decision Support System for Energy Policy Analysis," *Communications of the ACM*, Vol. 27, p. 1122 (1984).

Footnotes (Con't)

8) The range in savings reflects calculations using different modeling assumptions, particularly different estimates of future electricity prices. We have not calculated average dollar savings per household, because the savings are not uniform across households. (They are largest in homes constructed after the dates that all standards go into effect.)

9) The Audubon computer model does not distinguish between peak and average power. Consequently, we have assumed that the annual electricity savings are spread out uniformly over the year in deriving an estimate of the number of power plant equivalents that will be eliminated by the proposed standards. In fact, much of the savings from S. 2781 would come in the form of peaking plants rather than base load plants. In terms of real capacity, including peaking capacity, the proposed standards would save much more than 4000 to 8000 megawatts. (Note that in making these calculations we have assumed that the average power plant under consideration operates at 60% of capacity. Thus, the actual average power saved by the standards according to Audubon's calculations is 2400 to 4800 megawatts.)

Audubon's calculations can be compared with the more precise calculations presented by Howard Geller on September 10, 1986 before the House Subcommittee on Energy Conservation and Power ["Energy and Economic Savings Potential from National Appliance Efficiency Standards," American Council for an Energy-Efficient Economy, Washington, D.C., August 1986]. Geller, in his paper, did distinguish between peak and base load power, so a direct comparison of capacity eliminated is not possible. Nevertheless, a comparison can be made for average power. Averaging the annual energy savings he gives in Table 17, we find that his energy calculation is equivalent to a reduction of about 6,800 megawatts of power in the year 2000 (assuming a 10% transmission loss). This is somewhat higher than the 2400 to 4800 megawatts calculated by Audubon.

Although differences of this magnitude are not surprising given the uncertainty in predicting the behavior of the appliance market in the absence of standards, it is of interest to outline some of the differences in assumptions made in the different analyses:

A) Geller assumes that DOE will enact refrigerator and refrigerator/freezer standards that go beyond the interim standards specified in the bill. Audubon assumes no standards are in effect other than those specified numerically in the proposed legislation.

B) Audubon assumes higher electricity prices for some of its calculations than does Geller, thereby tending to project a larger impact of the market on improving appliance efficiencies.

These two differences in assumptions would be expected to decrease Audubon's calculation of electricity savings relative to Geller's. Other differences work the other way:

Footnotes (Con't)

C) Audubon assumes that the average consumption of appliances (except for water heaters) will be 15% less than the minimum specified in the proposed legislation. (Geller chooses 7.5%.)

D) Audubon does not discount future dollar savings to present values, thereby calculating larger dollar savings per unit of electricity saved. (Geller uses a discount rate of 5%.)

Some differences in assumptions tend to have competing impacts, making it difficult to make definitive statements as to their net effect:

E) Audubon calculates savings in the year 2005; Geller calculates them in 2000. Although more appliances built under standards will be in operation in 2005, tending to increase calculated energy savings in the final year, the market will have had longer to catch up with standards, tending to reduce annual energy savings attributable to the legislation in the final year. Of course, estimates of cumulative savings will always increase if the period under consideration is extended from 2000 to 2005.

A MODEL ACT TO PROMOTE ENERGY EFFICIENCY AND ENERGY CONSERVATION BY ESTABLISHING MINIMUM ENERGY EFFICIENCY STANDARDS

Prepared for the National
Audubon Society

With the technical drafting
assistance of Lisa R. Stearns,
Assistant Director, Columbia
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Drafting Research Fund

September 1, 1986

A MODEL ACT TO PROMOTE ENERGY EFFICIENCY AND ENERGY CONSERVATION BY ESTABLISHING MINIMUM ENERGY EFFICIENCY STANDARDS

Sec. 1 Findings and Purpose

Appliances for space heating, lighting, air conditioning, water heatings and refrigeration and freezing account for major primary energy use in buildings. If such appliances are inefficient they waste energy, thus promoting higher utility bills, increasing the need for additional non-renewable and imported energy resources, and hastening the need for new energy generating facilities. It is therefore in the public interest to promote the prosperity and quality of life for citizens by establishing minimum appliance efficiency standards to promote the use of cost effective appliances in the state.

Sec. 2 Short Title

This Act shall be known as the Appliance Efficiency Standards Act of 1987.

Sec. 3 Definitions

(a) "Secretary" means the Secretary of the agency placed in charge of administering the provisions of this Act.

(b) "Btu" means British thermal units.

(c) "Covered appliance" means an appliance for which efficiency standards are set pursuant to Sections 11-13 of this Act, and specifically includes floor models and demonstration units.

(d) "New" means to be sold, offered for sale, or installed for the first time.

Sec. 4 Scope; Exemptions

The provisions of this Act apply to new appliances sold, offered for sale, advertised, or installed in the state, regardless of where they were manufactured, except that the provisions of this Act do not apply to:

(a) appliances manufactured in the state, but delivered for installation outside the state pursuant to a contract for sale or invoice,

(b) appliances manufactured outside the state and sold at wholesale inside the state for final retail sale and installation outside the state. The exception in this subsection shall only apply, however, if records of such wholesale sales of non-complying appliances are retained for at least six months and the vendor notifies the purchaser in writing that such non-complying appliances cannot be sold at retail or installed within the state.

(c) appliances, other than water heaters, which are designed expressly for use in recreational vehicles and other mobile equipment.

Sec. 5 Pilot Lights

(a) Definitions

For the purpose of this section:

"Gas appliance" means any furnace, air conditioner, heater, refrigerator, range, dishwasher, clothes dryer, decorative fireplace log, pool heater, or other similar appliance which uses a gaseous fuel for operation.

"Intermittent ignition device" means a device which automatically ignites a gas appliance to begin operation, and which is activated only at the time such gas appliance is to be used.

"Pilot light" means any gas-operated device that remains continually lighted in order to ignite a gas appliance for normal operation.

"Residence" means any building or structure used principally for dwelling purposes but not including hotels, motels, or institutional buildings such as hospitals, nursing homes and dormitories.

(b) Prohibition of Pilot Light

Subject to subsection (c), no person shall sell, offer for sale, advertise, install or cause to be installed in the state a new gas appliance that is equipped with a pilot light.

(c) Exemptions

(1) Subsection (b) of this section shall not apply to:

i) water heaters,

ii) gas appliances designed to burn only liquefied petroleum gases,

iii) stoves or ranges which contain a separate section specifically designed to provide space heating,

iv) gravity-type room heaters, wall furnaces or floor furnaces which do not contain any electrical component,

v) any gas appliances installed outside the boundaries of an electric utility corporation service area, or

vi) any gas appliance concerning which it can be conclusively demonstrated by the equipment manufacturer, to the satisfaction of the Secretary, that a pilot light in the appliance has: a substantially lower life cycle cost than an intermittent ignition device, is more energy efficient than an intermittent ignition device, or is necessary to safeguard public health and safety.

Sec. 6 Testing Obligations of Manufacturers

(a) Duty to Test

The manufacturer of a covered appliance shall cause the testing of samples of each model of such appliance for compliance with the efficiency standards set pursuant to Sections 11-13 of this Act.

(b) Test Procedure

The test procedures used for the purpose of compliance with subsection (a) shall be in accordance with the United States Department of Energy test procedures in effect at the time of testing, unless no such test procedures have been adopted, in which case, the applicable test procedures shall be those adopted by the Secretary who shall, to the greatest extent possible, adopt American National Standard Institute testing procedures.

Sec. 7 Certification of Compliance with Energy Efficiency Standards

(a) Duty to Submit Certification Statement

Prior to sale, the manufacturer of a covered appliance shall submit to the Secretary a certification statement certifying that each model of a covered appliance complies with the applicable efficiency standard set pursuant to this Act. The certification statement shall include the following information:

(1) Name and address of manufacturer,

(2) Type of appliance,

(3) Brand name,

(4) Model number, as it appears on the appliance,

(5) Name and address of laboratory where test for efficiency was performed,

(6) Date of test for efficiency,

(7) Result of test for efficiency expressed in terms consistent with applicable test procedures and efficiency standard,

(8) Sufficient information about the model number or other identification by which the date of manufacture can be readily ascertained,

(9) A declaration that the appliance model complies with the applicable efficiency standards set pursuant to this Act,

(10) The dated signature of the manufacturer or an authorized agent of the manufacturer, attesting to the truth and accuracy of the certification statement under penalty of perjury.

(b) Seal of Certification

The Secretary shall create a seal of certification. If the Secretary finds that a certification statement is complete and accurate on its face, the Secretary shall, within forty-five days of receipt of the certification statement, authorize the affixing of a seal of certification in approved form to every appliance covered by the certification statement.

(c) Additional Information

If the Secretary finds that the certification statement is incomplete or inaccurate on its face, the Secretary shall, within forty-five days of the receipt of the certification statement, require that the manufacturer submit other information to permit the determination that a covered appliance complies with the applicable efficiency standard set pursuant to this Act.

Sec. 8 Inventory Limitation

After June 1, 1988, no person in the chain of production and distribution of a covered applicance, including the manufacturer, wholesaler, retailer, contractor, or builder, shall increase their inventory of a new covered appliance unless affixed to such an appliance is a seal of certification issued pursuant to Sec. 7 of this Act.

Sec. 9 Prohibition on Appliances Not Meeting Efficiency Standards

(a) New Covered Appliances Manufactured after January 1, 1988

After June 1, 1988, no person shall sell, offer for sale, advertise, install or cause to be installed within the state any new covered appliance manufactured after January 1, 1988, unless:

(1) the energy efficiency of the appliance meets or exceeds the applicable standard set pursuant to Sections 11 and 12 of this Act; and

(2) the appliance bears the seal of certification issued in respect of it pursuant to Section 7 of this Act.

(b) New Covered Appliances Manufactured before January 1, 1988

After June 1, 1988, no person shall sell, offer for sale, install or cause to be installed within the state any new covered appliance manufactured prior to January 1, 1988 unless:

(1) the energy efficiency of the appliance meets or exceeds the applicable standard set pursuant to this Act, or

(2) the date of manufacture can be readily determined from the model number or other manufacturer's identification provided with the appliance.

Sec. 10 Waiver from Prohibition Against Sale or Installation

The manufacturer of a covered appliance may apply to the Secretary for a waiver from the prohibitions under Sec. 9. Such a waiver shall not be granted, unless the applicant can show that the efficiency standard applicable to the appliance with respect to which a waiver is sought, is more stringent than the efficiency standard applicable to that appliance under the law of any other state.

Sec. 11 Appliance Efficiency Standards

(a) Air Conditioners and Air Conditioning Heat Pumps

(1) Definitions

For the purposes of this sub-section:

"Air conditioner" means one or more factory made assemblies which include an evaporator or cooling coil and an electrically driven compressor and condenser combination, and may include a heating function.

"Central air conditioner" means an air-conditioner which is not a room air conditioner.

"Coefficient of performance (COP)" of a heat pump means the ratio of the rate of useful heat output delivered by the complete heat pump unit (exclusive of supplementary heating) to the corresponding rate of energy input, in consistent units and under test conditions. British thermal units shall be converted to kilowatt-hours at the rate of 3412 Btu per kilowatt-hour.

"Cooling capacity" means a measure of the ability of a unit to remove heat from an enclosed space under test conditions.

"Energy efficiency ratio (EER)" means the ratio of the cooling capacity of the air conditioner in Btu per hour, to the total electrical input in watts under test conditions.

"Heat pump" means a combination of components including a compressor, a condenser and an evaporator, which may utilize air or water as the source of heat, and is combined with a central air conditioner.

"Heating seasonal performance factor (HSPF)" means the total heating output of a central air conditioning heat pump in Btu during its normal usage period for heating divided by the total electrical energy input in watt-hours during the same period, as determined under test conditions.

"Room air conditioner" means a factory encased air conditioner designed as a unit for mounting in a window or through a wall, or as a console. It is designed for the delivery of conditioned air to an enclosed space without ducts.

"Room Air Conditioning Heat Pump" means a room air conditioner, which is capable of heating by refrigeration, and which may or may not include a capability for cooling.

(2) Room Air Conditioner Efficiency Values

No room air conditioner manufacturered on or after January 1, 1988 shall have an energy efficiency ratio or a thermal efficiency (where applicable) less then the applicable values shown in Table 10-1.

TABLE 10-1

Appliance	Energy Efficiency Ratio	Thermal Efficiency
Room air conditioners		
* those with heating capability		90%
Room air conditioners		
* those designed for use with a supply of at least 200 volts	8.2	
* other heat pumps	8.3	
* all other room air conditioners	8.7	

(3) Central Air Conditioner Efficiency Values

Except as provided for in subsection (4), no central air conditioner manufactured on or after the date specified in Table 10-2 shall have an energy efficiency ratio, a seasonal energy efficiency ratio, a coefficient of performance or a heating seasonal performance factor less than the applicable values in Table 10-2

TABLE 10-2

Effective Date		Energy Efficiency Ratio	Seasonal Energy Efficiency Ratio	Coefficient of Performance	Heating Seasonal Performance Factor
January 1, 1988	Central air conditoners 65,000 to 135,000 Btu per hour (including heat pumps)				
	air source	8.2	-	-	-
	water source	9.2	-	-	-
	evaporative source	9.2	-	-	-
January 1, 1989	Central air conditioners less than 65,000 Btu per hour				
	air cooled, (excluding heat pumps)	-	8.9	-	-
	air source heat pumps	-	8.9	-	6.6
	water source heat pumps	9.0	-	3.2	-
January 1, 1993	Central air condtioners less than 65,000 Btu per hour				
	air cooled, (excluding heat pumps)	-	9.9	-	-
	air source heat pumps	-	9.9	-	6.8
	water source heat pumps	10.0	-	3.5	-

(4) Central Air Conditioners Not Covered

The following central air conditioners are excluded from coverage under subsection (3):

(i) those with a cooling capacity of more than 135,000 Btu per hour,

(ii) those designed to operate without a fan.

(b) Fluorescent Lamp Ballasts

(1) Definitions:

For the purposes of this section:

"Ballast or fluorescent lamp ballast" means a device to operate a fluorescent lamp by providing a starting voltage and current and limiting the current during normal operation. It must also be designed to:

(i) operate at nominal input voltages of 120 or 227 volts;

(ii) operate with an input frequency of 60 hertz; and

(iii) be used to operate an F40T12 or F96T12 lamp

"Ballast efficacy factor" means the ratio of relative light output, expressed as a percent, to the power input, expressed in watts under test conditions.

"F40T12 lamp" means a tubular fluorescent lamp which is a nominal 40 watts, with a 48 inch tube, 1½ inches in diameter. These lamps conform to American National Standards Institute standard C78.1 - 1978.

"F96T12 lamp" means a tubular fluorescent lamp which is a nominal 75 watts, with a 96 inch tube, 1½ inches in diameter. These lamps conform to American National Standards Institute standard C.78.3 - 1978

"Luminaire" means a complete lighting unit consisting of a fluorescent lamp, or lamps, together with parts designed to distribute the light, to position and protect such lamps, and to connect such lamps to the power supply.

"Nominal imput voltage" means an input voltage within plus 5 percent or minus 5 percent of - specified value.

"Nominal lamp watts" means the wattage at which a fluorescent lamp is designed to operate.

"Operation" means the ability to start the lamp at least 8 times out of 10 with a minimum of one minute between attempts when tested under test conditions.

"Power input" means the rate of energy consumption in watts of a ballast and fluorescent lamp or lamps.

"Relative light output" means the test ballast light output divided by a reference ballast light output using the same reference lamp and expressing the value as a percent.

(2) Fluorescent Lamp Ballast Efficacy Values

Except as provided in subsection (3) no fluorescent lamp ballast or luminaire manufactured on or after January 1, 1988 shall either have a ballast efficacy factor, or contain a ballast with a ballast efficacy factor, less than the applicable value in Table 10-3.

Table 10-3

Ballasts Designed for the Operation of	Nominal Input Voltage	Total Nominal Lamp Watts	Ballast Efficacy Factor
one F40T12 lamp	120	40	1.805
	277	40	1.805
two F40T12 lamps	120	80	1.060
	277	80	1.050
two F96T12 lamps	120	150	0.570
	277	150	0.570

(3) Fluorescent Lamp Ballast Not Covered

The following types of fluorescent lamp ballasts are excluded from coverage under subsection (2).

(i) those which have a dimming capability,

(ii) those intended for use in ambient temperatures of 0°F or less,

(iii) those designed to operate one F40T12 and having a power factor of less than 0.60.

(c) Gas Heaters and Furnaces

(1) Definitions:

For the purposes of this section:

"Boiler" means a space heater which is a self-contained appliance for supplying steam or hot water primarily intended for space heating application.

"Central furnace" means a self-contained space heater designed to supply heated air through ducts of more than 10 inches length.

"Duct heater" means a space heater designed to be installed within a duct.

"Energy consumption during stand-by" means the energy consumed by the gas space heater when the main burner is not operating. It does not include energy consumption related to associated cooling equipment. It shall be reported in average watts, based on a conversion factor of 3.412 Btu per watt-hour.

"Fan type heater or furnace" means a space heater or furnace which provides for the circulation of heated air at pressures other than atmospheric.

"Floor heater" means a self-contained, floor mounted space heater or furnace without ducts.

"Gravity type heater" means a space heater or furnace which provides for circulation of heated air through the differential densities of the heated air and the nonheated air.

"Room heater" means a free-standing non-recessed space heater.

"Seasonal efficiency" means a measure of the percentage of heat from the combustion of gas and from associated electrical equipment which is transferred to the space being heated during the year.

"Space heater" means an appliance that supplies heat to a space for the purpose of providing warmth to those objects within the space.

"Thermal efficiency" of a space heater means a measure of the percentage of heat from the combustion of gas which is transferred to the space being heated.

"Unit heater" means a self-contained fan type heater designed to be installed within the heated space.

"Wall furnace" means a wall mounted, self-contained space heater without ducts that exceed 10 inches.

(2) Gas Heaters and Furnaces Not Covered

The following types of gas heaters and furnaces are excluded from coverage under subsections (3) and (4) below:

(i) gravity type central furnaces,

(ii) those designed to operate without a fan.

(3) Gas Fan Type Central Furnace Efficiency Values

Except as provided in subsection (2), no gas fan-type central furnace manufactured on or after January 1, 1988 shall have a steady state efficiency and seasonal efficiency less than the applicable values shown in Table 10-4, nor shall the energy consumption during stand-by exceed the applicable value in Table 10-4.

Table 10-4

Appliance	Seasonal Efficiency
Gas fan type central furnaces	71%

(4) Other Gas Heater Efficiency Values

No gas space heater, room heater, boiler, unit heater or duct heater manufactured on or after January 1, 1988, other than a fan-type central furnace, shall have a thermal efficiency less than the applicable value in Table 10-5, nor shall the energy consumption during stand-by exceed the applicable value in Table 10-5.

Table 10-5

Appliance	Energy Consumption During Standby	Thermal Efficiency
Gas space heaters		
Wall,		
fan type	10 watts*	80%
gravity type	147 watts	70%
Floor,		
fan type	10 watts*	70%
gravity type	147 watts	65%
Room with capacity		
over 20,000 Btu/hour	147 watts	70%
other	147 watts	65%
Boilers	147 watts**	75%
Unit Heater	10 watts*	80%
Duct Heater	10 watts*	80%

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* For space heaters designed expressly for use with liquefied petroleum gases, the maximum energy consumption during standby shall not exceed 147 watts.

** For boilers designed expressly for use with liquefied petroleum gases, the maximum energy consumption during standby shall not exceed 352 watts for those with capacity over 300,000 Btu/hour. For those with a capacity under 300,000 Btu/hour, the maximum energy consumption during standby shall not exceed 293 watts.

(d) Refrigerators, Refrigerator-Freezers and Freezers

(1) Definitions

"Automatic defrost system" means a defrost system in which the defrosting action for all refrigerated surfaces is initiated and terminated automatically.

"Freezer" means a cabinet designed as a unit for the freezing and storage of food at temperatures of 0°F or below, and having a source of refrigeration requiring an energy input.

"Manual defrost system" means a defrost system in which the defrosting action for all refrigerated surfaces is initiated manually.

"Partial automatic defrost system" means a defrost system in which the defrosting action for the refrigerated surfaces in the refrigerator compartment is initiated and terminated automatically and the defrosting action for the refrigerated surfaces in the freezer is initiated manually.

"Refrigerator" means a cabinet designed for the refrigerated storage of food at temperatures above 32°F, and having a source of refrigeration requiring an energy input. It may include a compartment for the freezing and storage of food at temperatures below 32°F, but does not provide a separate low temperature compartment designed for the freezing and storage of food at temperatures below 8°F.

"Refrigerator-Freezer" means a cabinet which consists of two or more compartments with at least one of the compartments designed for the refrigerated storage of foods at temperatures above 32°F, and with at least one of the compartments designed for the freezing of and the storage of frozen foods at temperatures of 8°F or below 8°, which may be adjusted by the user to a temperature of 0° or below. The source of refrigeration requires energy input.

"Upright freezer" means a freezer whose access door is at the front of the appliance.

(2) Refrigerator, Refrigerator-Freezer and Freezer Efficiency Values

Except as provided in subsection (3), no refrigerator, refrigerator-freezer or freezer manufactured on or after the date indicated in Tables 10-7 and 10-8 shall have an energy consumption value (EC) greater than the values derived from the appropriate formula set out in Tables 10-6 and 10-7.

Table 10-6
Refrigerators and Refrigerator-freezers

Class	Formula	
	Effective January 1, 1988	Effective January 1, 1992
Refrigerators-Manual Defrost System	EC[1] = 17.3 AV[2] + 340	EC = 13.7 AV + 267
Refrigerator/Freezers-Partial or Manual Defrost System	= 24.7 AV + 486	= 17.4 AV + 344
Refrigerator/Freezers with:		
Top mounted freezer	= 24.1 AV + 487	= 16.7 AV + 336
Side mounted freezer	= 30.3 AV + 535	= 22.4 AV + 395
Bottom mounted freezer	= 30.3 AV + 535	= 22.4 AV + 395
Top mounted freezer with through the door ice service	= 26.8 AV + 540	= 18.5 AV + 374
Side mounted freezer with through the door ice	= 33.6 AV + 594	= 24.8 AV + 438
Compact Refrigerator/Freezers (less than 9 cubic feet)	= 24.7 AV + 486	= 17.4 AV + 344

[1] EC = Maximum Energy Consumption allowed in KWh per year

[2] AV = Adjusted Volume = [1.63 x Freezer Volume (ft)] + Refrigerator Volume (ft).

Table 10-7
Freezer Classes

Class	Formula	
	Effective January 1, 1988	Effective January 1, 1992
Upright Freezers[a] with:		
Manual Defrost	EC[1] = 21.4 V[2] + 480	EC = 14.5 V + 324
Automatic Defrost	EC = 33.7 V + 755	EC = 21.3 V + 477
Chest Freezer[b] and all other freezers	EC = 14.8 V + 384	EC = 10.9 V + 282

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[a] This class includes both Upright Freezers and Upright Compact Freezers (3 ft - 10 ft).

[b] This class includes both Chest Freezers and Chest Compact Freezers (3 ft - 10 ft).

[1] EC = Maximum Energy Consumption allowed in kWh per year.

[2] V = The total refrigerated volume in cubic feet.

(3) Refrigerators, Refrigerator-Freezers or Freezers Not Covered

The following types of refrigerators, refrigerator-freezers or freezers are excluded from coverage under subsection (2):

(i) those refrigerators and refrigerator-freezers with total refrigerator volume exceeding 39 cubic feet,

(ii) those freezers with total refrigerated volume exceeding 30 cubic feet,

(iii) those designed to be used without doors, and

(iv) those which do not include a compressor and condensor unit as an integral part of the cabinet assembly.

(e) Water Heaters

(1) Definitions

"Large storage-type water heater" means a storage-type water heater whose input rating exceed 75,000 Btu per hour (gas) or 12 kilowatts (electric).

"Mobile home storage-type water heater" means a storage-type water heater designed expressly for use in mobile homes.

"Small storage-type water heater" means a storage-type water heater whose input rating does not exceed 75,000 Btu per hour (gas), or 12 kilowatts (electric).

"Standby loss of a storage-type water heater" when expressed as a percent means the ratio of heat lost per hour to the heat content of the stored water above room temperature. When expressed in watts per square foot it means the heat lost per hour, per square foot of tank surface area.

"Storage-type water heater" means a water heater that heats and stores water within the appliance at a thermostatically controlled temperature for delivery on demand.

"Thermal efficiency or "recovery efficiency" of a water heater means a measure of the percentage of heat from the combustion of gas which is transferred to the water as measured under test conditions.

"Water heater" means an appliance for supplying hot water for purposes other than space heating.

(2) Water Heater Efficiency Values

No water heaters manufactured on or after January 1, 1988 shall have recovery efficiency or thermal efficiency values less than the applicable values in Table 10-8 nor shall the standby loss exceed the applicable value in Table 10-8.

Table 10-8

Appliance	Standby Loss	Recovery Efficiency	Thermal Efficiency
Water heaters			
Electric, mobile home storage type	4 watts per square feet	no requirement	no requirement
Electric, all other storage types	35 watts or 4 watts per square foot, whichever is larger	no requirement	no requirement
Gas, mobile home with storage capacity of			
less than 25 gallons	7.5 percent	75 percent	no requirement
25 up to 35 gallons	7.0 percent	75 percent	no requirement
35 gallons or more	6.0 percent	75 percent	no requirement
Gas, small storage type, other than mobile home type	2.3 + 67/V percent*	76 percent	no requirement
Gas, large storage type	2.3 + 67/V percent*	no requirement	76 percent
Gas, all others except pool heaters	no requirement	no requirement	75 percent

*Where V is the nominal volume in gallons

Sec. 12 Adoption of Standards to Cover other Appliances

(a) Whenever the Secretary makes a finding that an appliance not covered by Section 11 standards consumes a significant portion of either residential or commercial sector energy, the Secretary may adopt an energy efficiency standard for that appliance which is cost effective to the users of the appliance as a group.

Sec. 13 Review of Standards; Report

(a) The Secretary shall review the standards established under Sections 11 and 12 of this Act at least once every four years and shall strengthen the standards set forth therein, when appropriate to implement the long-term policy of this Act. Such revisions shall be based on a determination that more stringent standards are more cost-effective than prevailing standards to the users of the appliance as a group.

(b) The Secretary shall file a report of each review with the relevant state agencies. Such report shall include, but shall not be limited to:

i) an evaluation of the impact of the standards on energy efficiency and energy conservation in the state, and

ii) an evaluation of the activity undertaken to enforce the Act.

Sec. 14 Enforcement

(a) Inspection

The Secretary shall provide for the periodic inspection of manufacturers and distributors of covered appliances and may provide for the inspection of retail outlets of covered appliances in order to determine their compliance with this Act.

(b) Injunction

i) An attorney general or any district attorney, county counsel, city attorney or city prosecutor in this state may initiate in a court of competent jurisdiction an action for injunction against any person who violates or intends to violate any provision of this Act. Such an action may be taken on the prosecutor's own complaint or upon the complaint of any board, officer or person acting in their own interest or in the interest of the general public.

ii) The court may make such orders or judgments as may be necessary to prevent violation of the provisions of this Act, or which may be necessary to restore to any person in interest any money or property which may have been acquired by means of any practice which violates any provision of this Act.

(c) Civil Penalty

(1) Any person who violates any provision of this Act shall be liable for a civil penalty not to exceed $2,000 for each violation, which shall be assessed and recorded in a civil action brought in the name of the people of the state by the attorney general, or by any county attorney, or any city attorney in any court of competent jurisdiction.

(2) Civil penalties recovered pursuant to this section shall be paid to the State Treasurer and used to equitably reimburse the reasonable expenses incurred in the investigation and prosecution of the action.

(3) Each violation of this Act shall constitute a separate offense, and each day such violation continues shall constitute a separate offense.

Sec. 15 Regulations

The Secretary shall promulgate regulations to implement the provisions of this Act. In adopting such regulations, the Secretary shall comply with the State Administrative Procedures Act.

Sec. 16 Effect of Other Laws

The provisions of this statute shall apply to the extent that federal appliance efficiency standards are not applicable or if a waiver from such federal standards is obtained.

Senator EVANS. Thank you.
Mr. Corcoran.

STATEMENT OF DAVID A. CORCORAN, PRESIDENT, AMERICAN SUPPLY ASSOCIATION

Mr. CORCORAN. Good morning, Senator Evans.

I am David Corcoran, president of the R.B. Corcoran Co., which is a small plumbing and heating distributorship in southeastern Massachusetts.

I am also here today as president of the American Supply Association, which is the single national trade association comprised of 1,000 member firms of plumbing, heating, cooling, and piping products. The American Supply Association members have over 3,000 locations around the United States and are primarily small family-owned businesses whose median sales volume is $5 million annually.

After listening to the first witnesses this morning, maybe my testimony can give us a little perspective on what is currently happening in the marketplace today and how this bill will positively affect the marketplace if it is passed.

The products that we distribute affected by this legislation are hot water heaters, boilers, furnaces, and air-conditioners. We purchase these products from manufacturers and distribute them to installing contractors, builders, developers and commercial or institutional establishments. The appliance efficiency standards directly affect the distributor's profitability, the products he stocks, and the geographical territory he can service.

The American Supply Association supports S. 2781, the National Appliance Energy Conservation Act of 1986. The existing patchwork of varying State appliance standards, combined with many States with no standards at all, have created havoc and uncertainty for the distributors.

Passage of this bill is in the national interest. Not only will the legislation restore order to the marketplace for heating and cooling equipment, but will also promote energy conservation nationwide.

There is no doubt that appliance efficiency standards do encourage energy conservation. My experience in Massachusetts has been very positive. Massachusetts has a standard for hot water heaters and the standard is enforced in my geographic area. The only heaters that are sold are those that meet or exceed it.

The options available to the purchaser range from the model that meets the minimum requirement up to the super-efficient models. The consumer can use the State standard as a basis for judging the possible benefits in purchasing a higher efficiency model.

However, I cannot sell water heaters in the adjacent State of Rhode Island, a State without a standard. In order to do so, I would have to stock multiple inventories to meet the consumer demand in both States. Multiple inventories increase my cost to the point where I cannot justify the additional overhead.

The typical wholesaler with branches in adjacent States with varying standards has to increase his normal inventory by a factor of 20 percent to meet the demand in both States. A wholesaler who would normally stock 100 heaters, for example, would have to stock 120—60 for each different State standard. The excess inventory is a direct result of the different State requirements.

The excess inventory significantly increases the wholesaler's cost. Items in inventory cost a minimum of 2½ percent of the original cost per month per item. When applied against increased inventory necessary to meet the different State standards, the wholesaler either must reduce his profit margin or increase his price and a wholesaler's margin is already very slim, while an increased price puts him at a competitive disadvantage.

A second problem with the varying State standards is that a wholesaler with branches only in a State with a standard loses sales to the adjacent State. Prospective purchasers, particularly builders and developers interested in the bottom line, will cross the State line to purchase the lower priced, below-standard product.

The price differential between products in the adjacent States increases the likelihood of cross-border sales or transshipping. This is the case in Massachusetts along the New Hampshire and Vermont borders.

Transshipping is due, in part, to the failure of States with standards to provide adequate enforcement. The wholesaler who sells only equipment that meets the standard finds himself at a competitive disadvantage to sellers in adjacent States and to sellers within the State who chose to ignore the standard.

For instance, in New York State, an unenforced water heater standard costs wholesalers thousands of dollars in lost sales. A Buffalo wholesaler had sales of hot water heaters drop by $40,000 in an 8-month period because he was noncompetitive with others who were selling below-standard headers. Subsequent enforcement by the State of New York has alleviated the problem in Buffalo and New York City, but enforcement is still lacking in the Pennsylvania and Vermont border areas.

Another example of enforcement—or the lack of it—is in Florida. Appliance standards are enforced east of Tallahassee, but not enforced west of Tallahassee.

The unintended effect of varying State standards has been that the standards have become an important factor influencing competition and have needlessly increased the cost to the consumer. They create a competitive imbalance between the efficient and nonefficient product, with the nonefficient product having the advantage.

Product costs are increased because of increased handling and inventory expense, costs which have no bearing on the energy efficiency of the product.

A single national standard will meet the goal of energy conservation, allow both the manufacturer and wholesaler to conduct their business in an orderly manner and deliver the best product at the best price to the consumer.

Thank you.

Senator Evans. Thank you very much, and thanks to the entire panel for some very interesting and worthwhile testimony.

I did not say at the time of Mr. Geller's testimony, but it would be helpful to have a copy of your analysis for the committee's use during our deliberations.

With that, let me turn first to Mr. Gilbert. I noticed with interest on page 5 of your testimony, you mentioned the Voluntary Certification Program. And you said that if DOE chooses to refer to them, can permit effective monitoring of compliance at no expense to the taxpayer.

Could you elucidate a little more on the nature of the program and how you think that it might fit in with this legislation?

Mr. **Gilbert**. We test our products to the standards that are set by the DOE and publish these in our certification program. There is a booklet available to consumers, wholesalers, anyone that wishes to see that.

Under a voluntary program, those companies that specify certain products of an energy efficiency label are available and to be used by anyone as they so fit, as they so desire.

I do not see that there is a conflict in that in regard to the pending legislation or proposed legislation. We would still use the same test standards or test conditions that the DOE sets forth to meet the requirements that are set forth in the legislation.

Senator **Evans**. I know that in your testimony and Mr. Dowd's testimony and I believe also Mr. Bauer's testimony, there are varying statements all along the line that probably the marketplace itself would deal with the problems of efficiencies as customers would seek out more energy-efficient appliances, and that it is only the fact that we are in a situation where, with the Federal Government not issuing standards and States doing it on their own, you would have the chaotic balkanization of the marketplace.

Let me get to that in a couple of ways. First, what about—I am not quite sure what the percentage is, but I know in our work in the Northwest Power Council we found that a fairly significant percentage of appliances are not installed or purchased by owners at all; that in almost all apartments, in most condominiums, and certainly in virtually all spec homes the appliances are purchased by builders rather than owners.

They have a strong incentive to minimize the initial cost and not as large an incentive to look at the lifecycle costs.

In your view, with no standard, would the marketplace really react to energy efficiency with whatever percentage it is, but a fairly significant percentage of the appliances not being bought by the people who would benefit from them?

Mr. **Dowd**. Yes, Mr. Chairman; let me respond this way. First of all, empirically our industry can point to an actual 70-percent-plus improvement in average efficiency from 1972 till now, and that is during a time, of course, when there was heavy housing demand and that efficiency improvement was gained during that period.

Also let me point out the fact that, as manufacturers, we set up mass production runs so that builder type models are made essentially the same as retail-oriented models. We do not, in other words, typically manufacture to two levels of basic systems efficiency.

Rather, it is normally according to feature levels of cosmetics and so forth. So, from the manufacturing point of view, we feel that there is a competitive force at work and we do prefer the free enterprise method of getting to that state of affairs for the consumer.

However, when faced with two alternatives, one a crazy quilt of State standards versus a cohesive Federal approach, we much prefer the Federal approach and indeed are waiting to set forth a new wave of capital spending to achieve yet another plateau of energy efficiency for the future, for the nineties and beyond.

Senator EVANS. I do remember, however, during the time when the energy efficiency or costs of energy per year tags were prevalent on appliances, that there were significant differences even within one manufacturer's run for various models and the costs were quite different and generally the energy-efficient models were more expensive than the ones that were not quite so efficient.

In those circumstances, wouldn't the choice almost invariably of the spec builder or the apartment builder be to get the one with the lowest capital cost, regardless of energy efficiency?

Mr. DOWD. I think it is possible in some cases that those circumstances could previal, although I would point to the fact that over time manufacturers have created more efficient appliances as a matter of competitive survival.

Senator EVANS. Any of the others who have any comments, particularly from the manufacturer's viewpoint on this series of questions, please jump in.

As you look ahead, what do you foresee as the competition of international competitors and the effect they may have on energy efficiency of appliances? Take refrigerators as an example, one of the significant users of energy.

Is it your anticipation that we are more likely to construct and offer for sale those appliances, those refrigerators will meet, at least minimally, the standards established under the act, or will you be forced by the marketplace to go significantly beyond that because of competition from others who may have considerably more efficient appliances offered for sale?

Mr. DOWD. As stated earlier, the standard puts a floor or an insurance policy on energy efficiency levels and does ensure to the American consumer a minimum efficiency gain. We certainly expect, though, that above and beyond that, that free market forces will prevail and there will be competition in the area of higher energy efficiencies.

The FTC stickers, the energy guides, have been increasingly effective in informing consumers of the efficiency of an appliance.

With specific reference to offshore competition, all we are asking for in that regard is a level playing field. We believe that the balkanization of the different State standards would in effect create a situation where foreign competition could come in and cherry pick one particular part of our national market in an unfair fashion.

If we have a national market in which to operate, we feel that we can operate efficiently and take on all comers on a free trade basis. Indeed, we expect to have a very aggressive program going forward of exporting of appliances to foreign countries as well.

Simplification, as would be provided by this bill, of the regulatory environment would free up our engineers in order to design export products that comply with foreign competition in foreign markets and thereby benefit our trade balance in the United States.

Senator EVANS. I am curious. Yes, Mr. Gilbert.

Mr. **Gilbert**. Mr. Chairman, I wanted to address the builder's model that you touched on before.

Even though our energy costs have abated to some degree in the United States——

Senator **Evans**. Temporarily, I think.

Mr. **Gilbert**. Yes, I am afraid so. But I think the consumer is still very, very aware of his energy costs. And builders are turning in greater numbers, from our experience, to putting in more efficient appliances in order to use it as a vehicle to sell their products, whatever their structure might be. By advertising energy-efficient products in the home, they underwrite the potential consumer or buyer that they are current, that they are not going to be experienced with the highest energy costs that might be attendant to a lower efficiency model.

I think that is actually happening today. They look upon it as a sales vehicle.

Senator **Evans**. In looking ahead, is it necessarily always the case that more efficient appliances, the ones that meet energy standards and go beyond them, will necessarily be the more expensive appliance? And do we have opportunities as we go through the research and development on each of these appliances, to discover some opportunities that may lead to considerably more efficient appliances which may even be cheaper rather than more expensive than others?

Mr. **Gilbert**. Given enough time to go through the development process, that may very well happen. That, plus the economies of scale that you get if we can sell them in enough volume.

Senator **Evans**. Do you anticipate with the passage of an act like this, with lead time necessary and the establishment of specific standards, that that might well be the case? It would give you a period of stability to really get at some of the ways in which energy efficiency standards might be met with less rather than more expensive models?

Mr. **Gilbert**. It is possible. The time in the bill would provide that window for us. I cannot speak for the others.

Mr. **Dowd**. I would like to address that, too, Mr. Chairman, because I think you have hit upon a very germane point. Typically in our industry, equipment lead times in order to develop a new product, whether it be a cabinet line or a new foaming system, are of the nature of 3 years.

The stability that this bill provides allows manufacturers in the most efficient way to invest in capital, and indeed there are hundreds of millions of dollars of capital invested or contemplated to be invested in the near future. And in that way we can most efficiently and at the lowest possible cost provide consumers with these high efficiency products.

Senator **Evans** Mr. Dowd, in your testimony on page 11, you mention that some exclusions, refrigerators, for instance. Models without doors are intended for commercial use and excluded. Freezers with 30 cubic foot capacity and refrigerators with greater than 39 cubic foot refrigerated volume are designed for specialty use, have low volume sales and are excluded.

They have low volumes sales, but how about their total energy usage? Is that a significant share of the total refrigerator energy usage in the country?

Mr. Dowd. Mr. Chairman, I think that a finding not only of the industry members but also of the environmentalist groups was that it represents a de minimis case that is really not practical to regulate.

So, specifically to your answer, yes it is a very small portion of the energy consumption.

Senator Evans. On those rare occasions when I do get to a grocery store, you walk by the frozen food section, however, and you would think that they are trying to cool the whole outside.

Are there ways to attempt—and maybe it is de minimis—but collectively are there ways or efforts being made to try to design methods so people can get at the products and still not cool the whole store? How much incentive is there toward that? There certainly will not be any by legislation.

Dr. Goldstein.

Dr. Goldstein. Mr. Chairman, this bill is intended to address the problems with the implementation of the National Energy Conservation and Policy Act of 1978 which limits itself to residential appliances.

Senator Evans. I understand that.

Dr. Goldstein. I think there is a large potential for savings in commercial appliances as well. Grocery store refrigerators and freezers, some of the larger sized units that are excluded from this legislation but might be used in a small restaurant, say a 50-cubic foot unit, have a strong conservation potential. Even bigger, fluorescent lamp ballast in commercial buildings, a product which is regulated by a number of States, offers a conservation potential as great perhaps as everything in this legislation.

That is a separate issue which we would like to see future action on by the Senate. But assembling a consensus around that issue is another challenge, and that could burden the passage of this legislation, and so that is why we are not addressing it.

Senator Evans. In short, you are saying that this is step one, but step two may be right behind. And there may be some considerable benefits in that.

It is my understanding that one way in which homeowners or purchasers are able to enjoy the benefits of energy efficient appliances and still not pay the premium that sometimes is involved in the initial cost is that electric utilities, in order to reduce their own peak loads, are finding it possible to offer rebates or assistance to help alleviate that cost.

Let me turn to Dr. Goldstein and Mr. Geller and Mr. Butler on sort of this next series of questions that revolve around that.

What potential do you believe there is in that sort of action? I have been a strong advocate, certainly during the time as chairman of the Pacific Northwest Power Council, of the fundamental concept that every home, every commercial establishment, every industry, was a miniature generating plant and every utility ought to seek electricity from wherever they could get it. And the same I presume is true on gas as well. And you ought to buy it, just as you buy the capacity or the energy produced from a base station operating plant.

To what degree should we encourage, and is there anything we ought to do beyond encouragement, or will the marketplace itself, as far as the utilities are concerned, cause them to reduce the potential for new plants by further encouragement of super-efficient standards by the rebates they might offer?

In other words, is that a way to maybe even encourage buyers to go beyond—and manufacturers as a result—to go beyond the minimum standards that are established here to get something that is more cost beneficial to the purchaser?

Mr. **Geller**. I would like to respond and agree with this line of reasoning that you are developing. In my view the minimum efficiency standards for appliances are perhaps only one component of a comprehensive program to promote and encourage the purchase of the most energy-efficient and cost-effective appliances on the part of utilities, on the part of manufacturers, environmental groups, and so forth.

The appliance standards eliminate the energy-guzzling models. They are still, even today, looking at where the minimums are set in this legislation. Take one example: central air-conditioners. A minimum energy efficiency rating of 10, already in the marketplace. Today we have units ranging from 10 to 15, quite a variation, and for utilities that need even more savings than that which would accrue under this bill, there is still the opportunity to offer the incentives to get the 13's, the 14's, and the 15's purchased.

Perhaps by the time the standards go into effect, we will see even more efficient models.

So the standards can complement other programs such as rebates. We have been looking at these utility rebate programs. They have really grown in popularity. It is very likely that the majority of the consumers in the country are now eligible for some sort of rebate incentive for the purchase of energy efficient products and there is every reason to believe that that will continue and there will still be the need for and the opportunity for these other sorts of programs.

Senator **Evans**. But you would agree that if we pass this legislation, if the DOE reacts and sets minimum standards, there is no requirement for any utility to offer rebate to meet these. I mean they will get the benefits free, really, of additional efficiency that would be created by the standards we set.

Turning to manufacturers, do you think that if at that point there was continued need for utilities to get additional sources of energy, electricity let's say in this case, that they might offer considerable rebates for super-efficient appliances—do you think that would result in significant manufacture or demand and response from the manufacturers to something far beyond the standards that are being set here?

Mr. **Gilbert**. I think there would be some demand, Mr. Chairman, but I do not know if it would be significant or not because it is not a mandated thing. It would be up to the option of the consumer or the retailer to do it. But I think that those programs will continue. To the best of my knowledge they have been relatively successful for the utilities that have engaged in them.

Senator **Evans**. What if the utility tells somebody in a climate like this one that we have got real peak problems and if you get a super standard on air-conditioners, you can keep it on 60 minutes an hour. Otherwise, we are going to have to come in and put a timer on there, and you only get 50 minutes an hour.

You know, they can begin to do that kind of thing. Are those kinds of incentives likely to help? I am not sure they are practical, but there is going to be a really tight situation in some utilities at some point in the future where their peak demands are going to push up very, very close to their electric capacity.

Mr. **Gilbert**. In our case we find that for the homeowner to subscribe to the utilities program of interruptible or intermittent operation, they have not experienced any discomfort or uncomfort because of the product not operating a full 60 minutes.

I think that has been very successful and the utilities have begun it. Now, how that would compare with exceptional efficiencies and running on a more constant rate, I do not know. Probably a combination of the two would be pretty good.

Senator **Evans**. Yes, Mr. Butler.

Mr. **Butler**. If I could just add as an answer to your question, it seems to me that what you are promoting is greater use of a free market economy or at least market incentives, properly spoken.

One of the weaknesses of our present system is its short-term political focus. No one wants the rates to go up today so we put off the day of reckoning until we have a disaster. No one can possibly doubt that there will come a day, probably not too far in the future, of energy costs probably going up again and then we will face the very problems that you are suggesting here.

The other question is that we do not deal very well is with externalities, the problems of additional large power plants being built and going on line, questions of acid rain, questions of nuclear power. And what you are suggesting are many small incremental steps in which the individual consumer is able to make those judgments him or herself; peak load pricing, greater efficiency for appliances in return for some rebates of cost which, over the course of time, will help to alleviate these questions. It seems to me that they make eminent good sense.

The reason we have not adopted them more widely is because we—and I mean the American public, the utilities and the public generally—have got a very short time frame and because we do not think in terms of externalities: what are other costs, other than simply the costs to the ratepayers that are incurred when we have to build larger plants or new plants in order to deal with the sort of peakload problems that you have discussed?

Senator **Evans**. That leads to one interesting question for any one of the three of you from the environmental side. We have had two shortages, two very sharp emergencies in energy supply. We have had sharp rate increases as a result or sometimes for other reasons in many areas of the country.

Instead of this legislation, why should we be here just saying we ought to repeal the standards that are set, the ones which have led to this last 10 years of sort of waffling back and forth? Why don't we repeal the whole bunch and say external competition, the marketplace, good education, are all sufficient and that the marketplace generally works better than regulation? Why should we be involved at all?

Why aren't the American people smart enough to figure this out themselves?

Dr. Goldstein.

Dr. GOLDSTEIN. Senator Evans, the track record of the market in responding to energy efficiency has not been very good. There have been a number of times when efficiency improvements that might have a payback as short as 1 or 2 years simply are not implemented by the public.

The reason that you can get such fantastic economic benefits as well as environmental benefits from legislation such as this is that it solves structural problems that prevent the real economy from working the way the economics 101 economy would be expected to work.

There are a number of reasons for that. You have mentioned third party purchases as one. There is an educational issue. The fact that you buy a refrigerator once every 20 years, and it takes an awful lot of education over a long period of time to get the consumer ready to make a decision once and then forget about it for another 20 years.

Senator EVANS. Isn't that part of the marketplace? There will be real competition between manufacturers and distributors to try to convince the consumer that their product is the best one, the most efficient one, the one that will save them the most money.

Isn't it a matter of consumer education which is what the marketplace is all about?

Dr. GOLDSTEIN. The predicate for the belief that competitive forces will come to the economically optimal solution is that there is perfect information and people know how to use that.

Senator EVANS. That is true for government in its regulatory capacity as well. [Laughter.]

Dr. GOLDSTEIN. That is why we are doing this by consensus.

Mr. GELLER. To elaborate a bit, the scenario of letting the marketplace do whatever it does results in a lot of uncertainty. We do not really know whether consumers are going to respond, whether manufacturers are going to produce products at the life cycle cost minimums, and utilities, as you are well aware, are planning 15, 20 years into the future. With that large uncertainty about where power demand is going, they end up going forward with building five nuclear powerplants in a region and maybe four of them turn out to be unneeded and you have a major disaster that could cripple an economy in an entire region.

So the uncertainty that that free market creates is extremely dangerous and we are pushing the marketplace to efficiency levels that are cost effective for consumers and at the same time providing utilities with a little bit more certainty as to where their demand is going and helping them in their forecasting and planning.

Senator EVANS. Isn't that the nature of a free society? A little uncertainty? There is not much uncertainty in the Soviet Union. They have got it all well controlled.

Mr. GELLER. But sometimes it does not work.

Senator EVANS. But are we attempting to eliminate all uncertainties?

Mr. DOWD. Mr. Chairman, if I may add to the comments of these gentlemen, the manufacturers of appliances I think would agree with the basic thesis that you put forth, that free American forces can get the job done.

However, we have an unusual circumstance here, wherein by providing Federal regulation, the committee and the Congress would actually be deregulating. And what I mean is this. The political reality is that we are faced with a proliferation of individual State standards, so by providing the guidance of this bill we are actually deregulating the situation and providing a fixed beacon against which the manufacturers can design and provide a more efficient appliance and work within the free enterprise system.

Senator EVANS. Let me turn finally to Mr. Corcoran. You are the go-between, I guess. You have got to really deal with the customers and with the manufacturers. And from your testimony it sounds like the question of builder versus consumer purchase is a significant one as between two States or adjoining communities, one of which has a standard, one of which does not.

Do you find that that truly is the case? You have the comparison then as to what actually does happen in the marketplace. A State with a standard, a State without a standard; are you finding that in a State without a standard they will opt for the low capital cost versus the most efficient appliance?

Mr. CORCORAN. I would say your comments on the third party purchasers were more accurate or more reflect the marketplace than the theory that educating the public will get the consumer to buy the more efficient model. That person who can be educated to that level to make that decision, to my mind really only represents 10 or 15 percent of the buying public who will opt for the higher efficiency model.

The experience, if you got to the actual marketplace from one State who has the standard to the other which is right across a straight line in New England, we can do that in pretty much of a hurry—you will find that the lower standard always prevails and prevails to 85 percent of the market.

Senator EVANS. Do you have any estimate in your area, for instance, as to what percentage of typical household appliances are purchased by consumers versus those purchased by builders?

Mr. CORCORAN. We have a program—you have to understand, I do not want to sell appliances per se like kitchen appliances. I am more in the heating end of the business. And in that area, because it is so technical, the consumer very rarely or the end user very rarely gets involved in the purchase.

In the other aspects of our business, we find that the builder specifier is the one that is dictating the purchase because we are in a high new construction market area. I think more in the remodeling areas, that then the consumer becomes more involved in the transaction and therefore is more a part of the efficiency decisions.

Senator EVANS. We had a series of questions which I have not gone ahead and asked but which have been distributed to you. It would be particularly helpful to us as we try to finalize this legislation to have any comments you might have on such things, for instance, as the new definitions which are added in the law, but a number of other rather technical terms which are not specifically defined.

I am not sure whether they need to be, but it would certainly be helpful to get your comments on such things as energy factor package, terminal heat pump, national voluntary consensus standard, and rating conditions. To what degree do we need specific definitions of those terms in the legislation?

Perhaps we don't, but you might respond for the record if you have any comments on that or any of the other questions that have been distributed to you.

Senator Ford.

Senator FORD. I was not here to listen to the testimony and so I will pass. I do have a little statement that I would like to make prior to the next witness and I do have some questions for the next witness.

Senator EVANS. All right, fine. With that, we thank you very much for your testimony and for the remarkable work that has been done to date and hope in the short period of time we have left in this session we can pull off a miracle.

Thank you very much.

The next panel, Mr. Alan Streb, Deputy Assistant Secretary for Conservation of the U.S. Department of Energy. While he is coming to the table, I would ask that three other statements submitted for the record be included in the record: One from Senator D'Amato; the testimony of First Co.; the testimony of the Whirlpool Corp.

[The statements of Senator D'Amato, Mr. Nation, and Mr. Takacs follow:]

ALFONSE M. D'AMATO
NEW YORK

United States Senate
WASHINGTON, DC 20510

September 10, 1986

The Honorable Don Nickles
Chairman
Subcommittee on Energy Regulation and Conservation
Committee on Energy and Natural Resources
United States Senate
Washington, DC 20510

Dear Don:

I understand that your subcommittee is planning a September 16th hearing on S. 2781, legislation to amend the Energy Policy and Conservation Act with respect to energy conservation standards for appliances. As a cosponsor of this bill, I commend you for holding this hearing, and I want to let you know of my support for prompt passage of this legislation.

As you may know, the State of New York also supports the purpose of the bill, but has specific proposals which they believe would improve or clarify S. 2781. They recently outlined these concerns in a letter to me with attachments proposing alternative language.

I have enclosed a copy of the letter I received from the New York State Energy Office. I would appreciate it if you would include this letter in the September 16 hearing record and consider the suggestions included in it. For your information, although not for inclusion in the record, I have also attached the alternative language suggested by the State.

Once again, I thank you for your leadership on this extremely worthwhile legislation.

Sincerely,

Alfonse D'Amato
United States Senator

AD:enr

cc: Mr. William D. Cotter, Commissioner
New York State Energy Office

NEW YORK STATE ENERGY OFFICE

WILLIAM D. COTTER
COMMISSIONER

September 5, 1986

Honorable Alfonse D'Amato
United States Senate
520 Hart Senate Office Building
Washington, DC 20510

Re: S.2781/H.R.5465 - A Bill to Amend the Energy Policy and Conservation Act with respect to Energy Conservation Standards for Appliances

Dear Senator D'Amato:

As you may know, New York State has long favored adoption of national appliance efficiency standards, as was provided for in Federal legislation enacted in 1978. The State actively participated in Federal rulemaking proceedings to establish such standards and joined with others in successfully challenging in court the decision of the Department of Energy (DOE) to adopt "no-standard" standards under existing Federal law.

As you also may know, the appliance industry and a number of environmental organizations led by the Natural Resources Defense Council (NRDC) have concluded negotiations resulting in a legislative proposal (S.2781/H.R.5465) to establish national appliance efficiency standards for certain residential appliances. We have comprehensively reviewed this proposal and are supportive of it. We believe that this proposal has been made possible, to a large extent, by the efforts of States like New York in pursuing their own meaningful standards.

At the same time, however, we believe the proposal can be improved in several important respects, particularly the provisions relating to the preemption of more stringent State standards, as discussed below.

The current language of S.2781/H.R.5465 requires that DOE reject any State petition to retain more stringent State standards if industry can show that a State standard will cause a significant burden, or that a proposed State regulation is likely to result in the unavailability of performance characteristics, features, sizes, capacity or volumes of affected appliances generally available within the State, regardless of how compelling a State's need for such standards may be. We believe the Department of Energy should be required instead to balance the impacts of such burden and the needs of the State in determining whether to grant the State's petition. Where the burdens outweigh the need for a more stringent standard, it is reasonable for the State regulation to be preempted; but where the benefits of the State standard exceed the burdens, it should be exempt from preemption.

We appreciate industry's desire to avoid a proliferation of inconsistent State requirements for their products. However, we believe there should remain a reasonable opportunity for States, in limited circumstances, to address their particular energy conditions through the imposition of more stringent efficiency standards. We recommend therefore that S.2781/H.R.5465 be amended to provide for a balancing of interests in connection with the waiver process.

Although we are also concerned about the manner in which the "unavailability" provision may be applied, these concerns could be mitigated by providing guidance on its application through legislative history.

A related problem regarding the waiver process concerns the timing of the effective date of State standards which are the subject of a successful State petition. The bill would delay the effective date of such standards until three years after the publication of the approval of the petition or the earliest possible effective date for DOE revised standards for that appliance, whichever is later. In some cases, as with respect to air conditioners, furnaces and boilers, this would generally preclude a State standard which has been exempted from preemption from becoming effective until the next century.

We believe the bill should be amended to provide that the effective date of a State standard which is granted a waiver be determined on a case-by-case basis after considering all the evidence presented in connection with the State's petition, rather than arbitrarily fixing such date by statute.*

I have attached for your consideration proposed language to amend S.2781/H.R.5465 to accomplish these objectives. (Alternative 1.) A small number of clarifying language changes are also proposed, as well as an amendment which would accord New York the same treatment as accorded California with respect to the application of more stringent standards for refrigerators, refrigerator/freezers, and freezers, provided New York State enacts or prescribes standards which are the same as those which have been adopted in California. Also included in Alternative 1 is proposed legislative history language which would provide desirable guidance on such issues as: the meaning of the terms "significant burden" on the appliance industry and the "unavailability" of an affected product, as used in connection with DOE's consideration of a State petition for a waiver from

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*At a minimum, an exception should be provided in connection with the three year delay in the effective date of a waiver in the case of an energy emergency. Where such condition exists, which imperils the health, safety and welfare of a State's residents and cannot be substantially alleviated through other means, it would be unreasonable to delay the imposition of the State standard.

Federal preemption and DOE's consideration of new or amended Federal standards; and the extent of potential energy savings a new or amended Federal standard must be able to achieve before DOE is authorized to prescribe such a standard which is technologically feasible and economically justified.

New York is dependent on out-of-state sources for over 90 percent of the fuels consumed in the State, and many New Yorkers pay the highest electric rates in the nation. Accordingly, it is important that New York have the ability to establish in a timely fashion State appliance standards which are necessary or appropriate to address our special energy circumstances.

If our proposed amendments to S.2781/H.R.5465 are not acceptable, then as an alternative, Congress should provide legislative history that clarifies its intention that States be given substantial latitude in adopting and implementing more stringent State standards where unusual and compelling energy conditions exist. I have included in Alternative 2 legislative history language which we propose be included in a Committee Report in this case to accomplish this and other related objectives.

In summary, we strongly support the intent and purpose of the proposed bill. We believe, however, that the revisions we are proposing would provide DOE and the States with greater flexibility to respond to national needs as well as to unique energy conditions confronting each particular State, while not imposing any unreasonable hardship on the appliance industry.

If we can provide any additional information or assistance in your consideration of these issues, please contact my General Counsel, Stanley Klimberg, at (518) 473-4937.

Cordially,

William D. Cotter

William D. Cotter
Commissioner

WDC/md
Attachments

TESTIMONY OF FIRST CO. ON S. 2781, THE NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

My name is James H. Nation. I am President of First Co., a manufacturer of air handling equipment and evaporator coils used in central air conditioning systems and heat pumps. Unlike large integrated manufacturers which make complete split system air conditioners, First Co. supplies evaporator coils which are combined with the condenser units made by other manufacturers to form a split system air conditioner. First Co. also supplies evaporator coils used in heat pumps. There are numerous other small to mid-size companies that are independent producers of evaporator coils.

First Co. manufactures coils that are tailor-made to meet certain needs in the marketplace; for example, climate conditions or space restrictions may require a specialized coil. In these situations, First Co. coils may be substituted for the coils offered by the condenser manufacturer because the First Co. coil better suits the consumer's needs.

First Co. generally supports S. 2781, but we feel strongly that certain aspects of the bill must be clarified so that agencies charged with implementing the law will not misinterpret Congressional intent and impose ruinous burdens on independent coil manufacturers. The two areas which we feel clarification is needed concern: the meaning of the term "manufacturer"; and the requirement that split system air conditioners be "tested."

Independent Coil Manufacturers Are Not "Manufacturers" Of A Covered Product

The Energy Policy and Conservation Act ("EPCA") defines the term "manufacturer" as meaning "any person who manufactures a consumer product." The term "manufacture" is defined as meaning "to manufacture, produce, assemble or import." EPCA Section 321(a)(10)(12).

Section 322 of EPCA lists 13 "covered products" including central air conditioners. Independent coil manufacturers do not manufacture a "central air conditioner," but only make a single component which is used in combination with other components to make a central air conditioner. Thus, independent coil manufacturers do not manufacture a covered product under EPCA.

Split system air conditioners typically are assembled by builders or contractors working in conjunction with local distributors. Thus, the independent coil manufacturer neither manufactures nor assembles the split system air conditioner and, therefore, is not a "manufacturer" within the meaning of EPCA.

S. 2781 makes certain changes to the "definitions" and "coverage" sections of EPCA, including adding a new definition of the term "central air conditioner." See Section 321(b)(21). It is our understanding that these changes were not intended to change the coverage of the Act in terms of the independent coil manufacturer. Thus, it is our understanding that manufacturers of components for split system air conditioners, that do not also manufacture, produce, assemble or import the entire system, do not fall within the definition of "manufacturer" under EPCA, as amended by this bill. We feel that this should be made clear in the legislative history.

Although independent coil manufacturers are not directly covered as "manufacturers," they are affected by the requirements of EPCA. When builders or contractors assemble a split system air conditioner using a First Co. coil, the builder or contractor may come within the definition of a "manufacturer" that assembles a split system. Oftentimes, these builders or contractors lack the ability to "test" the assembled combinations and turn to the individual coil manufacturer to provide the necessary data. This may be particularly true in the area of the labeling requirements under EPCA.

The Federal Trade Commission has authority to implement rules pertaining to labeling of consumer products under EPCA. On August 11, 1980, the FTC published a proposed rule pertaining to central air conditioners. Comments and testimony were received on the proposed rule, and a staff report analyzing those comments and recommending amendments to the rule was later published in the Federal Register for additional public comment.

We felt strongly that the recommended rule amendment had the effect of placing a disproportionate burden on independent coil manufacturers and we so advised the FTC in our comments. While we recognize that this is a matter to be handled in rulemaking, we feel that rules implementing EPCA should not impose the heaviest burdens for compliance upon individual coil manufacturers who are not "manufacturers" under EPCA. Therefore, we feel that the legislative history should include an expression of Congressional intent that administrative agencies acting under the authority of EPCA should minimize the impact of their rules on individual component manufacturers to the greatest extent possible. This would be entirely consistent with existing law under the Regulatory Flexibility Act which requires administrative agencies to minimize the economic impact of their rules on small business entities.

Testing Of Covered Products Includes "Rating"

EPCA requires the Department of Energy to establish "test procedures" for covered products and requires manufacturers to "test" their products using these procedures.

In 1979, the Department of Energy published final "test procedures" for central air conditioners, including heat pumps. During the course of rulemaking, DOE recognized that requiring manufacturers to conduct actual tests on all condenser-coil combinations would be unduly burdensome, particularly on independent coil manufacturers whose coils could be combined with a variety of condensers. DOE also found that computer simulation or engineering analysis techniques could be used to accurately predict the performance of split systems. Therefore, the final DOE rule permitted the use of approved computer simulation or engineering analysis rating procedures.

In terms of the independent coil manufacturer, DOE made the following conclusions:

> After thorough review of the comments received from manufacturers who produce only evaporator coils, DOE acknowledges the need to provide these manufacturers with a method by which they can make representations of the efficiency of split system central air conditioners which use their evaporator coils in combination with other manufacturers' condensing units. DOE agrees that a rule which requires builders or coil manufacturers to test their evaporator coils with the condensing units of numerous other manufacturers would be burdensome. However, it is equally important that an accurate rating procedure for these split systems be established to ensure that consumers will be able to determine the estimated cost of operation and the efficiency of these combinations. DOE has concluded that an analytical method which utilizes computer simulation or other engineering analysis to predict the performance of these combinations is the most accurate alternative to testing. The method to predict the performance of the condenser-evaporator coil combination must be based upon condensing unit performance data provided by the manufacturer of the condensing unit. Today's final rule allows the use of this technique for evaporator coil manufacturers to rate split system combinations using their evaporator coils with another manufacturer's condensing unit. This approach will provide consumers and installers with accurate energy consumption and cost of operation information for these systems and will also protect evaporator coil manufacturers, which are typically small businesses, from any competitive disadvantage. . . .

44 F.R. 76702-76703 (December 27, 1979).

The National Bureau of Standards is currently working on a standardized rating procedure for split systems. In the interim, First Co. has developed a rating procedure using engineering analysis which has been independently reviewed and approved for use by DOE.

It is our understanding that the amendments proposed in S. 2781 were in no way intended to undo the test procedures for air conditioners adopted by DOE, which permit the rating of split systems by means of approved computer simulation or engineering analysis techniques. This appears to be reflected by the language in proposed section 323(a) which states, "All test procedures and related determinations prescribed or made by the Secretary with respect to any covered product (or class thereof) which are in effect on the date of enactment of the National Appliance Energy Conservation Act of 1986 shall remain in effect until the Secretary amends such test procedures and related determinations under subsection (b)." Nevertheless, in view of the importance of this matter, we feel strongly that the legislative history should clearly state that nothing in the bill was intended to prohibit the rating of split systems by means of DOE-approved computer simulation or engineering analysis techniques.

I would like to thank the Committee for considering our views and concerns. We feel that the clarifications we have suggested fairly and accurately reflect the intention of the proponents of this bill and should be incorporated in the legislative history. With these clarifications, we lend our support to the bill.

Whirlpool
CORPORATION

ADMINISTRATIVE CENTER · BENTON HARBOR, MICHIGAN 49022
GOVERNMENT AND PUBLIC AFFAIRS · (616) 926-3210

A. J. TAKACS
VICE PRESIDENT

August 26, 1986

The Honorable Daniel J. Evans
Subcommittee on Energy Regulation
  and Conservation
212 Hart Senate Office Bldg.
Washington, D.C. 20510

Dear Senator Evans:

I would like to submit the attached statement from Whirlpool Corporation for the hearing record on the National Appliance Energy Conservation Act of 1986, S. 2781.

Whirlpool Corporation fully endorses this bill, and has been extremely active in its preparation, and, we feel it is a well-conceived legislative document.

I know of no logical opposition to this bill.

I would appreciate your entering this statement in the official hearing record on behalf of Whirlpool Corporation.

Sincerely,

Andy Takacs

AT/kp

Attachment

cc: Don Nickles
    James A. McClure

Whirlpool Corporation

Written Comments

In Support of

S. 2781

The National Appliance
Energy Conservation Act
of 1986

August 28, 1986

Whirlpool Corporation is the leading manufacturer of domestic home appliances in the U.S. with manufacturing facilities in six states.

We are pleased to join with AHAM, ARI, GAMA, the NRDC and others to endorse immediate passage of S. 2781, the National Appliance Energy Conservation Act of 1986.

The appliance energy efficiency standards outlined in this bill represent a balance between the stringent levels that environmentalists were seeking in a short period and the more realistic standards and timetables sought by industry. It also goes a long way toward resolving the devastating problem our industry would face if several states enacted their own standards laws.

Instead of continuing the long standing face-off on the energy issue, both sides have worked together to negotiate this mutually beneficial solution to a complex problem. As a result of this "Grand Compromise", we have a unique opportunity to achieve the original aims of the energy policy and conservation act -- but without long and costly federal rulemaking proceedings.

We urge you to support this bill that will:

1. set fair and reasonable standards;
2. provide energy savings;
3. continue the availability in the future of commercially acceptable and affordable quality products to American consumers.

We know of no logical opposition to this bill and urge the Energy Regulation and Conservation Subcommittee to act rapidly to assure enactment of S. 2781 during 1986.

Thank you for your concern. If you have any additional questions or desire more information, please contact:

Andrew Takacs
Vice President
Government & Public Affairs
Whirlpool Corporation
2000 U.S. 33 North
Benton Harbor, MI 49022
(616) 926-3219

Leo Soorus
Director
Government Affairs
(616) 926-3057

Senator **Evans**. Now that Mr. Streb is here, Senator Ford, would you like to give your comments?

STATEMENT OF HON. WENDELL H. FORD, A U.S. SENATOR FROM THE STATE OF KENTUCKY

Senator **Ford**. Yes, Mr. Chairman; I would like to make a brief statement. I am pleased that we are revisiting the issue of appliance standards. I am doubly pleased that after much maladministration we now have a vehicle with a consensus in back of it. I just hope we have enough time in this session to move our bill as the House is in the process of moving theirs.

Mr. Chairman, each of us probably is wrong a little more than he is right on energy issues. However, I do take a great deal of satisfaction in S. 2781's approach to State standards, Federal standards, legislative requirements, and preemption. These basic provisions of S. 2781 validate the positions that I have fought rather strongly for almost 10 years when I opposed what I perceived to be the threatened balkanization of the U.S. appliance industry.

Thank you, Mr. Chairman.

Senator **Evans**. Thank you, Senator Ford.

With that, let us turn to the testimony of Mr. Streb. Please go ahead.

STATEMENT OF ALAN J. STREB, DEPUTY ASSISTANT SECRETARY FOR CONSERVATION, DEPARTMENT OF ENERGY

Mr. **Streb**. Good morning, Mr. Chairman, Mr. Ford.

Mr. Chairman and Mr. Ford, I welcome the opportunity to comment on S. 2781 a bill which would amend the Energy Policy and Conservation Act regarding appliance energy efficiency standards. DOE appreciates the efforts of interested parties to address and reach a consensus on this issue which has already engendered expensive rulemaking and litigation.

I would like to submit my full prepared statement for the record.

Senator **Evans**. Your full statement will be placed in the record.

Mr. **Streb**. And I will simply make some brief remarks.

The goal of increasing our Nation's energy efficiency is one which we strongly support. Energy efficiency contributes more to balancing our national energy ledger today than any other single fuel source.

If pre-1973 trends in energy had continued, DOE calculates that Americans would be consuming 29 quadrillion BTU's, about a third of our total energy consumption, more in primary energy than we actually did in 1984.

Since 1972, manufacturers have invested millions of dollars in research, development, demonstration, and commercialization of energy efficiency improvements in appliances. The results have been significant improvements in efficiency.

For example, between 1972 and 1984 the weighted average energy efficiency of new refrigerators increased approximately 71 percent; clothes washers increased 55 percent; freezers, 59 percent. These achievements have been made without Federal standards.

Efficiency improvements such as these, undertaken in response to market forces, coupled with the normal turnover of our capital stock, promise to provide continuing improvement in our national energy efficiency.

Continued economic growth will accelerate the market penetration of these more efficient appliances and sustain the strong trend toward energy efficiency.

S. 2781, on the other hand, would mandate a regulatory approach by imposing Federal energy efficiency standards for 11 products and allowing the Secretary to add to, but not to subtract from, the list of product standards.

The admininistration has a number of concerns about such an approach. First of all, national standards do not compensate for regional or State variations in product usage and could result in an inequitable distribution of costs and benefits between regions.

Second, imposition of Federal standards would also have an effect on competition within the marketplace. It is possible that some firms would receive a competitive advantage over others that are not as well prepared to adjust to these new standards. This could result in consolidation of product lines, readjustment of market share, and possible negative employment impact.

Further, by attempting to legislate specific approaches to energy conservation, this bill could discourage innovation and thus development of some new products that could have the desired energy use outcome. The impact of standards on small firms is also a matter of special concern to the administration. Finally, these standards are expected to result in an increase in the first cost of appliances. The standards could cause consumers to defer or forgo the purchase of new, more efficient appliances which could in turn defer energy savings.

For these reasons, Mr. Chairman, the Department continues to support the repeal of federally mandated appliance standards as proposed in the Energy Conservation Simplification Act.

While we continue to believe in the importance of energy conservation, we do not believe that it can be achieved as efficiently by regulation as by individual decisions of consumers who pay for energy and thus have a stake in encouraging, through their purchase choices, the manufacture of more efficient products.

In order to provide the information needed by consumers to continue making these decisions, DOE continues to support the FTC appliance labeling program.

Mr. Chairman, we appreciate the opportunity to present our views on this matter and we pledge to work with you in a constructive manner in support of our mutual goal of improving the Nation's energy efficiency.

I would be pleased to respond to any questions that you may have, sir.

[The prepared statement of Mr. Streb follows:]

STATEMENT

OF

ALAN J. STREB

DEPUTY ASSISTANT SECRETARY

FOR CONSERVATION

U. S. DEPARTMENT OF ENERGY

BEFORE THE

SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION

OF THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

SEPTEMBER 16, 1986

Mr. Chairman and Members of the Committee, I welcome the opportunity to comment on S. 2781, a bill which would amend the Energy Policy and Conservation Act regarding appliance energy efficiency standards. DOE appreciates the efforts of interested parties to address and reach a consensus on this issue, which has already engendered expensive rulemaking and litigation.

The goal of increasing our Nation's energy efficiency is one which we strongly support. Energy efficiency contributes more to balancing the national energy ledger today than any single fuel source. If pre-1973 trends in energy use had continued, DOE calculates that Americans would have consumed about 29 quadrillion Btu's, about one-third, more of primary energy than they actually did in 1984. The "energy productivity" of the U.S. economy (dollars of GNP per unit of energy use) increased 28 percent during the decade from 1974 to 1984; and it rose 14 percent in the last 4 years of that period alone. Conservation has taken hold because it is the most cost-effective of all energy options in a great variety of circumstances.

The private sector has worked to deliver energy conservation to a much greater extent than many analysts forecast during the 1970's. Since 1972, manufacturers have invested millions of dollars in research, development, demonstration, and commercialization of energy efficiency improvements in appliances. The result has been significant improvements in efficiency. For example, between 1972 and 1984, the weighted average energy efficiency of new refrigerators increased approximately 71 percent, clothes washers 55 percent, and freezers 59 percent. These achievements have been made without Federal standards. Efficiency improvements such as these, undertaken in response to market forces, coupled with the normal turnover of our capital stock promise to provide continuing improvements in our national energy efficiency. Continued economic growth will accelerate the market penetration of these more efficient appliances and sustain the strong trend toward energy efficiency.

Energy efficiency improvements will continue to come about mainly from individual decisions in the private sector, and these often require a weighing of capital costs (including interest and other charges for money) against continuing reductions in daily, weekly, and monthly bills over a period of years. In order to provide the information needed by consumers to make these decisions, DOE continues to support the FTC appliance labeling program. The labeling program is in place and is helping the private sector to meet the need for consumer education. Energy efficiency is becoming more and more of a sales factor, thus making efficiency improvements even more likely. Evidence already is available that companies are using the energy efficiency of their products as selling points in their advertising. The consumers who pay for energy have a stake in encouraging, through their purchasing choices, manufacture of more efficient products.

S. 2781, would mandate a different approach. For example, this bill would impose Federal energy efficiency standards for 11 products with effective dates ranging from January 1, 1988, to January 1, 1993, and would allow the Secretary to add to, but not subtract from, the list of product standards. The bill would require the Department to reanalyze each standard on a perpetual schedule of every 5-10 years, regardless of need. The small business exemption, 325(s)(1), is the same as exists in the current law, i.e., the annual gross revenue level of an eligible company may not exceed $8,000,000 from all operations. The bill allows for an exemption to begin when the standard becomes effective rather than when standards are prescribed as in the current law. The bill also makes a number of other changes to the current law. For example, the bill adds pool heaters to the program and eliminates television sets, humidifiers and dehumidifiers from the program. Finally, if the bill is approved, all State standards will be completely superseded by the Federal regulatory regime.

The Administration opposes energy conservation regulatory programs, including Federal mandatory appliance energy efficiency standards, because they are burdensome, unnecessary, and place undue restraints on manufacturers of major household appliances as well as limit consumer choices. The Department therefore continues to support repeal of Federal consumer-appliance standards as proposed in the Energy Conservation Simplification Act (H.R. 4906), introduced on behalf of the Department. Federal intervention in the marketplace is generally ill-advised and more often than not can result in higher costs and a loss of efficiency in the affected industry. Our experience with energy conservation programs tells us that the premise of the bill - that energy consumption will decrease substantially as a result of the mandated standards - may not necessarily be valid. Higher energy efficiency will reduce the operating costs of appliances, and these lower costs can increase appliance utilization. Indeed, under certain conditions, energy efficiency standards may actually lead to an increase in the amount of energy used by some appliances. Furthermore, national standards do not compensate for regional or State variations in product usage and could result in an inequitable distribution of costs and benefits between regions. For example, the climatic variations between states such as Florida and Michigan make it very difficult to apply uniform standards to air conditioners and furnaces in a way that would not impose unnecessary financial burdens on some consumers. Further, imposition of Federal standards will undoubtedly have an effect on competition within the marketplace. It is likely that some firms (perhaps even foreign manufacturers) would receive a competitive advantage over others that are not as well prepared to adjust to the new standards. This could result in consolidation of product lines, readjustment of market shares, and perhaps negative employment impacts if failure of some firms results. Further, by attempting to legislate specific approaches to energy conservation this bill could discourage innovation and thus the development of some new products that could have the desired energy-use outcome. The impact of standards on small or non-typical firms is also a matter of special concern to the Administration.

The Administration also has a number of other concerns about the effect of imposing Federal standards. By increasing Federal control in energy markets, this bill would create economic rigidities in the marketplace and, in turn, penalize consumers. If these standards result in an increase in the first cost of appliances, reallocation of household income could reduce the purchasing power of consumers in the early years. Further, increased cost could cause consumers to defer or forego the purchase of new, more efficient appliances, which would, in turn, defer energy savings. The impact of standards from the perspective of energy suppliers is also a matter of concern. The effects of appliance standards on energy suppliers in both the short and long run depend on many factors that are specific to each supplier. For example, changes in load shape and sales resulting from the standards could yield negative or positive impacts on energy suppliers, depending on each company's economic circumstances.

With regard to specific provisions of the bill, we have a number of comments. First, the bill would require that each standard be reanalyzed on a five to ten year schedule, depending upon product type, in perpetuity and regardless of need, to determine whether more stringent standards are economically justified, technologically feasible, and likely to result in a significant conservation of energy. Such a schedule is more rigid even than current law and could hamper the Secretary's ability to conform Departmental priorities to the country's changing energy needs. We would suggest that review occur as provided in present section 325(h). Second, while DOE may lump a number of products together in a rulemaking, there exists a substantial likelihood of lawsuits under the proposed legislation each time the Secretary makes the required determinations and any person believes the Secretary has failed to comply with the deadlines or other requirements.

Third, some of the terms used in the bill would complicate the Department's activities and would appear to make the standards program overly rigid. For example, "thermal efficiency of pool heaters" is defined in terms of the test procedure for measuring the efficiency of pool heaters, which in turn is spelled out in the law. It appears that any changes to the test procedure would then have to be effected by amendments to the statute. As new products are introduced into the marketplace, the legislation would have to be changed in order to include these new designs in the program.

Fourth, it would also be prudent to examine thoroughly the exemption of State standards from Federal preemption. States would be allowed to petition the Department for an exemption from preemption based upon "unusual and compelling State or local interests," but the tough criteria contained in the bill make it very unlikely that such a petition would ever be granted. We believe that the petition procedures set forth in S. 2781 are unduly burdensome to the States. We believe that each State is in a better position to evaluate the relative benefits of a national or State regulatory program for appliances in its area in light of the particular local conditions. Finally, the bill makes no provision for manufacturers affected by the Federal standards to petition for an exemption or waiver of those standards on a showing of special circumstances.

Since 1975, the States have operated many differing appliance efficiency programs with little apparent adverse effect on the industry. However, we do recognize that if States adopt significantly different standards, such standards could, in time, impose large costs on manufacturers due to the differing standard levels and certification requirements. We have no objection to the establishment of voluntary national standards that the States could choose to adopt. Such guidelines could be developed with the assistance of a professional society, such as the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, as well as any other interested parties. We believe that if States were to adopt voluntary standards, the difficulties and costs of multiple standards would be resolved and the States would have flexibility to address the problems associated with local variations in usage. Adoption of such a voluntary standard would resolve the difficulties and costs imposed on manufacturers by multiple standards.

In conclusion, Mr. Chairman, the Department continues to support the Energy Conservation Simplification Act and to oppose Federally mandated appliance standards. We do appreciate the opportunity to present our views on this matter and we pledge to work with you in a constructive manner in support of our mutual goal of improving our Nation's energy efficiency.

Mr. Chairman, this concludes my prepared statement. I would be pleased to respond to any questions that the Committee members may have.

Senator EVANS. Thank you very much, Mr. Streb.

From your written testimony and a litte more detail I would, I guess, capsulize your testimony by saying you think the bill is a bad idea and so is the current law. Is that pretty accurate?

Mr. STREB. We are generally opposed to regulation with respect to appliances, Mr. Chairman, and for that reason continue to support the repeal of the legislation which currently requires the establishment of standards.

Senator EVANS. Do you have any feeling that that legislation is likely to move very far?

Mr. STREB. Sir, I cannot speculate on that.

Senator EVANS. Was there an attempt by the Department to have that bill introduced in the Senate?

Mr. STREB. I believe that there was, sir. So far as I know, it was not introduced into the Senate. It was introduced into the House.

Senator EVANS. Was that because no Member of the Senate was willing to introduce it?

Mr. STREB. I do not know the answer to that, sir.

Senator EVANS. But there was an attempt to introduce it in the Senate?

Mr. STREB. There was an attempt to introduce it.

Senator Evans. I cannot think of any other reason for not getting it introduced than the fact that nobody would introduce it. Is that a pretty good conclusion to draw from that?

Mr. STREB. Yes, sir.

Senator EVANS. In your testimony you talk about the feeling that they place undue restraint on the manufacturers, the economic rigidities that would be included in the marketplace, and the fact that it would penalize consumers, and that in fact these standards result in an increase in the first cost of appliances, reallocation of household income could reduce the purchasing power of consumers in the early years, could cause consumers to defer or forgo the purchase of new, more efficient appliances, which would in turn defer energy savings.

Are you aware that an increasing number of lending institutions are willing to qualify homebuyers to buy more expensive homes if they buy energy efficient homes that will save energy over the lifetime of the loan? In other words, they will capitalize the energy savings and give the homeowner the chance to get a better home than he might otherwise get on the basis that the income of the homeowner to pay off the loan is not just the income necessary to pay the mortgage, but it is also the income necessary to pay the operating costs of that home.

Mr. STREB. Yes, sir; I am aware that such incentive programs exist in certain areas, but that does not provide assistance to the homeowner who is purchasing a new appliance, who may be in a marginal situation and therefore cannot afford the more expensive appliance that results from the application of standards.

Senator EVANS. Well, you are assuming that it will be a more expensive appliance. Were you here when the testimony was given by the previous panel?

Mr. STREB. I heard some of that testimony, sir.

Senator EVANS. It seems to me that I heard that some of them said as time goes on, that we very well could get to a position where energy-efficient appliances might be cheaper, not more expensive.

Mr. **Streb.** In time, I think that would be the case.

Senator **Evans.** Senator Ford, I will turn to you.

Senator **Ford.** Thank you, Mr. Chairman. I have three or four questions.

If, as the administration——

[Pause.]

Senator **Ford.** I have plenty of time.

Mr. **Streb.** Excuse me.

Senator **Ford.** That is perfectly all right. I have plenty of time. I may ask staff some questions, too, before I get through with you.

If, as the administration desires, the Congress repeal NECPA, then the States would regulate the appliance industry, we would have a State-regulated free market—State-regulated free market.

Is that what you are after? Is a State-regulated market more efficient than a federally regulated market?

Mr. **Streb.** Senator Ford, I believe that the States already have the administrative structure to suggest and to impose building standards. And the State-regulated market would come within the framework of those building standards, a structure which is already in place.

Now, we do recognize, however, that the adoption of individual State standards, if it is done in a haphazard way—and to use the terms of the some of the previous witnesses, to create a patchwork quilt of regulation—does impose a burden on the manufacturer of appliances. For that reason, we would suggest that the corrective action may be in the form of guidelines which would be developed by a professional society such as ASHRAE that would be adopted in a more or less uniform fashion by the States and manufacturers and therefore prevent, except for minor appropriate regional differences, this so-called patchwork quilt of regulation from evolving.

Senator **Ford.** Have you ever worked for State government? [Laughter.]

Mr. **Streb.** No, sir; I have not had that pleasure.

Senator **Ford.** Well, I was Governor at one time, and you all can just "go to" if you are trying to tell me how to regulate. If I have the opportunity to regulate, I am going to appoint people to do it.

You know where Bristol, TN, is?

Mr. **Streb.** Yes, sir.

Senator **Ford.** Aren't there about three States that come together right there at Bristol?

How would you like to be the manager of a Sears, Roebuck store at Bristol, TN, with three different appliance standards from three different States?

Mr. **Streb.** That would be very difficult, Senator.

Senator **Ford.** That is right. And your position is making it very hard for the manager at the Bristol, TN, Sears, Roebuck or whatever other store it might be.

In your prepared statement—and I quote from it: "The administration opposes energy conservation regulatory programs, including Federal mandatory appliance energy efficient standards."

If the administration opposes State regulations in this same area, why do they grant a preemption waiver under NECPA to virtually every State who submits a timely petition? Those States are now free to regulate the appliance industry, aren't they?

Tell me why.

Mr. STREB. Under the current law, there was very little in the way of requirements that the Department had to operate on when acting on a State petition. Essentially, the only thing that the State had to prove was that the standard that they were proposing was tougher than the Federal standard, which, of course, was very easy to do when we had "no standard" standards.

So, in all cases where we actually acted, the Department did act favorably.

Senator FORD. But didn't you give a blanket waiver? Wasn't it just a blanket? You paint with a broad brush and say they were free from any preemption?

Mr. STREB. No; my understanding of the current law is that they were automatically preempted by Federal standards. However, the States were free, of course, to petition for a waiver, which they did in about 33 cases, as I recall. And five of those waivers were, in fact, granted.

We were acting, we were in the process of acting on the balance and probably would have acted on them favorably when the court acted to stop that whole process.

Senator FORD. OK. But of those five or six that you gave, weren't those just blanket waivers, just total waiver from preemption?

Mr. STREB. I believe that they were based on specific standards that were proposed for certain appliances in each of those States. They were not blanket waivers, but they were specific to the States in which the waiver——

Senator FORD. But anyhow, you gave them whatever they asked for.

Mr. STREB. We had little power to do anything else.

Senator FORD. Did you ever think of pocket veto or pigeon hole or something?

In your statement, you said—and I quote again: "Higher efficiency standards will reduce the operating cost of appliances and these lower costs can increase appliance utilization."

You argue that in some cases, efficiency standards may even lead to a derease in the amount of energy used. Now, this sounds like the administration prefers freezing in the winter and sweltering in the summer to enhance energy efficiency.

Is that what you meant?

Mr. STREB. Well, what we were trying to convey there is that the estimates that one would make of the performance gain—that is, energy savings gain that could be achieved as a result of a specific improvement in efficiency—may be somewhat deceptive.

We have evidence which would support that. It is deceptive because the improved efficiency or the lessened use of energy encourages a greater use of that particular appliance in certain circumstances. So it is not to say that improved efficiency is not a good thing. We strongly support that. It was simply to say that the improvement in efficiency, if you take credit for all of that in terms of the reduced energy demand, you could be misled somewhat.

Senator FORD. Well, I do not think any of the utilities are opposed to appliances using less energy. At least I have not found them to be that way.

On the one hand, your statement argues for the States adopting voluntary national standards—that is what you said just a moment ago—developed by professional societies. On the other hand, arguing against Federal standards, you say—and I quote: "National standards do not compensate for regional or State variations in product uses."

Isn't your statement internally inconsistent?

Mr. STREB. It would appear to be on the surface but we are suggesting——

Senator FORD. Appearance up here is about all we have. Imagery. You know, you can make a lot with imagery. The tube has just about got us all. I ran out of blue shirts and red ties today.

Mr. STREB. The proposal was to use a national consensus, voluntary consensus guideline as a standard to be followed by the States. Now, such a consensus guideline could very easily incorporate into it regional differences to account for the differences in climatic conditions that would occur from area to area.

That would mean that for all practical purposes, adjacent States would have very much the same kind of standard, whereas the difference between the conditions that exist in Maine perhaps and California would be considered and recognized within the guidelines that would be used by the States in the development of their own building code standards.

Senator FORD. Something that is awfully hard for me to understand. We are sitting here with a tax reform bill. That tax reform bill is increasing the tax on corporations or businesses.

Then we turn around and we look at something that would give them an opportunity for a break, at least to be consistent, and the administration says no, we do not want to do that. We want them to have to produce 50 separate pieces of equipment, separate stoves, separate refrigerators, whatever it might be.

I heard so often, get them off our back and out of our pocket. That meant get them off our back with regulations; get them out of our pocket for taxes. It seems like you are just wanting to stick them harder than they have ever been stuck before.

Coming from a Democrat, that does not sound right. But I just wanted you to know that I kind of feel like industry out there needs as much help as they can get. They do put out catalogs, and if you put out a catalog that goes to Kentucky—and they might buy from Indiana, Ohio, Tennessee, whatever it might be—then they have to put four or five different appliances in a catalog.

How in the world can my legislature that meets every other year and this legislature that meets every year—and they approve standards, and maybe they don't have to approve them—maybe the Governor can sign them and they will issue them—you cannot even keep up with your catalog.

It seems to me that you are doing two things here. You are not giving the manufacturer a break and you are not giving the consumer a break. And you have an opportunity to support a bill that gives a manufacturer a break and gives the consumer a break. It is just like you stop buying oil for the strategic petroleum reserve;

you all bought when oil was high and now that it is low, you stop buying. Dad taught me, buy low and sell high. [Laughter.]

Senator FORD. There are just so many inconsistencies here. I wish you were on television so we could beam you back to my constituency and let them see how you are making the statements here.

You look like a nice fellow that has been forced up here against your will. I really am finding myself where I am being compassionate toward you. Did you run this statement through OMB before you came up here?

Mr. STREB. Yes, sir. A number of times.

Senator FORD. A number of times. Oh, well.

I have one more question. What is the administration doing with respect to appliance efficiency standards now that the Federal court has ruled against the Department? When do you anticipate you will issue these standards for appliances?

Mr. STREB. We have mounted an aggressive program of the reanalysis which was required by the court order which will extend through calendar year 1987 as we see it now. We anticipate the development of standards for all the products that are required by the court to occur sometime in the early part of 1988, with publication of those in mid-1988, finalization of all standards as a package, we would hope to occur in mid-1989.

Now, those standards at that point become effective, are imposed on the manufacturer in accordance with a schedule that we would set, depending on the perception on our part of the difficulty of the manufacturer to achieve whatever standard has been set over a period of 5 years from that point.

So the standards would begin to take place during perhaps as early as early 1989 and would be completely in place by 1994, which parallels closely the imposition of standards as included in the proposed legislation.

Senator FORD. Well, Mr. Chairman, I certainly hope that you will do what you can. I hope that you are on the right track to see that this piece of legislation is on the fast track, because when you get a consensus with one exception, that proves that most everybody is right.

I am not trying to ridicule you, Alan, at all. I just think that you have been put in an untenable position and I cannot understand why. But, Mr. Chairman, I hope we can get this legislation out at the next markup and move right on with it and see if we cannot equal our colleagues in the House with a piece of legislation that is on the President's desk before we leave here.

May I ask you a question? Do you know when we are going to leave?

Senator EVANS. I do not have an inside to the White House, unfortunately.

You have just heard Senator Ford at his kindest and most compassionate. [Laughter.]

Senator EVANS. Let me just extend a couple of questions that Senator Ford has asked. I guess maybe I would preface it by asking first, you did run this testimony by OMB without breaking any internal confidences within the Administration.

Would you say that the resulting testimony that is being given now is primarily that of OMB or the Department? Were there significant differences in the testimony given to OMB and the testimony that came out of OMB?

Mr. **Streb**. The final product that came out of OMB very closely resembles that which the Department submitted.

Senator **Evans**. OK. So this is then, for all practical purposes, the Department's view and not modified in any significant way by OMB?

Mr. **Streb**. That is a correct statement.

Senator **Ford**. Spoken like a true soldier, Mr. Streb.

Senator **Evans**. That is one of the rare occasions we have had that answer, too.

Senator **Ford**. Yes, but when they are basically the same, as he says, they didn't have any reason to change it.

Senator **Evans**. That leads me to the question then, how would you judge the administration would really view the whole question of establishing certain national standards for automobiles? If we carry this free marketplace and State and voluntary regulation to its extreme, would you advocate that we abandon national standards on automobiles and let every State set the headlight and other standards for automobiles, let the free market do it?

Mr. **Streb**. No, sir. I do not think that would be practical.

Senator **Evans**. What is the difference?

Mr. **Streb**. I believe the difference is that you do have a State regulatory body in place, State process for the establishment of building codes which is a mechanism which could very easily be used to impose appropriate standards for appliances.

You do not have a comparable mechanism for automobiles.

Senator **Evans**. Well, you certainly could have if they had the power to do it. If they were given the power to do it, they would quickly develop those mechanisms. Do you think it is a good idea?

Mr. **Streb**. I do not think it would be a good idea.

Senator **Evans**. I guess I did not ask the question quite explicitly enough. Was there any significant difference in the testimony you present today as it was developed by the Conservation Office within the Department of Energy and as it went to the head office of the Department of Energy?

Mr. **Streb**. The position out of the Office of Conservation and Renewables was to not oppose the proposed legislation. The proposal to OMB from the Department was not quite the same.

Senator **Evans**. You say not quite the same, or quite the same?

Mr. **Streb**. Yes, sir. Not quite the same.

Senator **Evans**. So the Conservation Department essentially said do not oppose, and it was the headquarters of the Department of Energy and then OMB that chose to oppose the legislation?

Mr. **Streb**. That is correct.

Senator **Evans**. You know, the thesis that somehow energy efficiency leads to greater use rather than less use, I suppose, comes from the idea that people may, because of cost, keep their homes warmer during the summer than they otherwise would.

I am not sure that because you have a more efficient refrigerator, people are going to open and close it more often than otherwise, or that we are going to zap everything twice in a microwave instead of once, or cook more frequently or more gourmet meals simply because the stove is more efficient.

You said you had evidence. Would you care to share that with the committee, or can you forward it to us so that we have that evidence that shows increased usage?

Mr. STREB. I would be happy to forward more information to the committee, but in general it relates to the RCS program that we had a hand in operating some time ago. This is the Residential Conservation Service Program in which we anticipated savings that resulted from certain improvements that occurred in houses were not fully experienced, and we believe it was due to changes in the habits of the residents of the home.

Senator EVANS. Is there any specific evidence to show that or is that just an assumption?

Mr. STREB. Yes. There is some specific statistical information.

Senator EVANS. Statistical information that you did not achieve what you thought you were going to achieve.

Mr. STREB. Correct. There was nevertheless—and understand, my earlier statement did not mean to suggest that more efficient appliances would result in a greater consumption of energy. A greater consumption of energy per unit of product is what we are saying.

So in other words, to correct that once again, I am trying to convey that greater efficiency in a furnace, for example, or in an air-conditioner can very easily lead to a greater usage of that furnace or air-conditioner in order to maintain more acceptable comfort conditions.

And as a result of this, there is still a net gain, there is a net improvement in overall energy use which is, of course, what we are looking for. It may not be as great as that which we would project were we to simply use the same number of hours of usage of those appliances.

Senator EVANS. I understand. We were very familiar with all of those activities. We went through conservation standards in the Pacific Northwest Power plant.

Is the statistical information really confined to the fact that you estimate savings at a certain level and did not achieve them or does it more specifically prove that there was increased usage of the various appliances after more efficient appliances were installed?

Mr. STREB. Well, I understand that in specific cases it was determined that thermostat settings, for example, were increased after the more efficient appliances were installed, which would tend to support the argument that I presented just before.

Senator EVANS. Well, is that merely anecdotal? What percentage of thermostats were turned up, what percentage were kept at their previous levels? In other words, how significant is the information you have? It would be useful to the committee to get that. When you say you have evidence——

Mr. STREB. I believe that we have information that could support that. It doesn't represent 100 percent sample of all the changes that were made. But it would be a statistically valid sample.

Senator EVANS. OK. But it would be useful if you would submit that for the committee.

Mr. STREB. Yes. I would be happy to do that.

[The information follows:].

We are providing the Committee with a report entitled, "Indoor Temperature Changes After Retrofit: Inferences based on Electricity Billing Data for Nonparticipants in the BPA Residential Weatherization Program, which provides evidence that homewowners "take back" energy savings after retrofit in the form of comfort.

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Indoor Temperature Changes After Retrofit: Inferences Based on Electricity Billing Data for Nonparticipants and Participants in the BPA Residential Weatherization Program

Eric Hirst
Dennis White

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ENERGY DIVISION

INDOOR TEMPERATURE CHANGES AFTER RETROFIT: INFERENCES BASED ON ELECTRICITY BILLING DATA FOR NONPARTICIPANTS AND PARTICIPANTS IN THE BPA RESIDENTIAL WEATHERIZATION PROGRAM

Eric Hirst
Dennis White

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SUMMARY

The behavioral response (e.g., changes in indoor temperatures, attention to window and door openings) to residential technical efficiency improvements (e.g., attic insulation, storm windows) is largely unknown. Although there is considerable discussion concerning the extent to which households take back some of the energy savings due to efficiency improvements in increased comfort, there is almost no empirical evidence on the subject.

Detailed electricity billing data for three years (from mid-1981 through mid-1984) were analyzed for households that received financial assistance from the Bonneville Power Administration to retrofit their homes in 1982 or 1983, and for eligible nonparticipants. The analysis focused on changes in year-to-year annual electricity use (pre- vs post-retrofit) and the components of these changes (baseload, space heating, and the effect of changes in indoor temperatures). The analysis was limited to homes with "clean" electricity billing data that used only electricity for space heating, 242 homes in all. This limitation was imposed to exclude homes that use wood or other nonelectric fuels for some or all of their space heating. Restricting this study to nonrandom samples of program participants and nonparticipants suggests that the findings developed here may not apply to the population of households in the Pacific Northwest.

The mean retrofit expenditure in participant homes was $1700. The mean one-year reduction in annual electricity use between 1981/82 and 1982/83 was 4300 kWh for the 1982 program participants, of which more than 90% was due to reductions in space heating electricity use. Analysis of the nonparticipant billing data for the same time period showed a mean reduction of only 1300 kWh, of which 75% was space heating. The 1983 participants cut consumption by an average of 3500 kWh between 1982/83 and 1983/84, of which more than 95% was due to reduced space heating electricity use. Nonparticipants increased consumption during this period by 300 kWh. Thus, both participant groups cut consumption by substantially more than did nonparticipants, with net savings of 3000 kWh for the 1982 participants and 3800 kWh for the 1983 participants.

Further analysis of the electricity billing data suggests that the 1982 and 1983 participant households increased their indoor temperature settings after retrofit by about 0.4 and 1.3°F, respectively. The nonparticipants, on average, left their indoor temperatures unchanged between the first and second years and then increased temperatures by about 1/4°F between the second and third years. These results indicate that participants increased their temperatures more than did nonparticipants, by roughly 0.4 - 1.0°F, which supports the notion of a take-back effect.

The participant indoor temperature increases led to estimated average losses of 200 and 1200 kWh/year for the 1982 and 1983 households, respectively. In other words, roughly 5% of the energy saving due to retrofit

was taken back in terms of increased comfort for the 1982 participants, and roughly 25% for the 1983 participants.

These results concerning changes in indoor temperatures should be viewed cautiously because of the strong assumptions embodied in the analytical method and the large variation across households.

1. INTRODUCTION

BACKGROUND

The ways in which households behave after retrofits are installed in their houses is an important but unresolved issue. Microeconomic theory suggests that households will "take back" some of the technical efficiency improvements due to retrofits in increased comfort. The reasoning is as follows. Improvements to the structure of a building, its heating equipment, or both, lower the operating cost of the heating system. The rational economic response to this reduced cost is to purchase more of the system's output (i.e., winter warmth) by raising indoor temperature settings, opening up previously closed rooms, and so on.

Psychologists offer other models of household behavior, not all of which are consistent with that of the economically rational person (Stern and Aronson, 1984):

> The Consumer views his property (home, car, boat) as providing amenities, rather than as an investment. Cost and cost-effectiveness considerations are less important than the services provided.
>
> The Group Member is influenced by what others think. Energy-related behavior is affected less by economic factors and more by social values.
>
> The Committed believes in saving energy. Installation of retrofit measures is likely to lead to even lower thermostat settings to ensure that the conservation actions save energy.

Unfortunately, there is virtually no empirical evidence with which to assess the agreement between these different models and actual consumer behavior. Nevertheless, there is considerable discussion and speculation about consumer take back and its likely effect on conservation program energy savings and economics (Stern, 1984).

For example, the federal residential tax credit is intended to encourage people to install retrofit measures in their homes. Engineering calculations are used to estimate the likely energy savings due to installation of these measures. However, if the behavioral response to these efficiency improvements affects, for example, temperature settings, actual and predicted energy savings will differ. Consider the case in which the actual saving is less than predicted. If decisions on implementation of conservation programs are based on traditional engineering calculations (i.e., the savings anticipated due to efficiency improvements assuming no change in household behavior), then the actual program (e.g., tax credits) may not be as economically attractive as originally planned.

The behavioral response can be viewed in two ways. An increase in personal comfort due to higher temperature settings after retrofit is a benefit of the conservation program. Alternatively, if the program is intended to save fuel (for example, a utility's effort to purchase "conservation energy"), household increase in comfort is a program cost.

Two points summarize this discussion. First, the amount of fuel actually saved after retrofit depends on household behavior. Second, the social value of the retrofit may differ from the value of the fuel savings.

PAST RESEARCH

A literature review and discussions with colleagues in other research organizations uncovered almost no information on the direction and extent of this takeback effect (Hirst, White, and Goeltz, 1984).

Meyers and Schipper (1983), in their review of trends in national residential energy use from 1973 through 1982, conclude that "the decline in indoor temperatures has perhaps played the major role in reducing average household energy demand. In 1973, some 85 percent of all households kept their daytime indoor temperature at a cozy 70°F or higher. By 1981, similar heating practice was reported by less than 45 percent of households."

Fels and Goldberg (1983), in their analysis of recent changes in residential natural gas use in New Jersey, obtained consistent findings. They conclude that much of the post-1973 energy saving observed in New Jersey was due to behavioral changes, reflected in lower indoor air temperatures.

Adams and Rockwood (1983) analyzed data on individual households, collected during a 1979 national survey, to estimate the effects of increased thermal performance of residential buildings on energy use. Their analysis suggested that a 20% increase in shell thermal efficiency (equivalent to a 17% decline in space heating energy use due to technical improvements) would yield an 8% energy saving in gas-heated homes and a 14% saving in electrically heated homes. In other words, increases in temperature settings and other behavioral changes would "take back" half the potential gas saving and 20% of the potential electricity saving.

The National Bureau of Standards (Crenshaw and Clark, 1982) collected data on indoor temperatures in their low-income weatherization project. Unfortunately, limited resources prevented them from analyzing the temperature data relative to efficiency improvements to the building shell and its mechanical equipment.

Kempton and Krabacher (1984) measured thermostat settings and indoor and outdoor temperatures in seven Michigan homes. Their study produced a wealth of detailed data on patterns and determinants of thermostat management. Unfortunately, their sample size is extremely small and none of these homes was retrofit during the time of data collection.

Vine (1984) analyzed data on household self-reports of temperature settings and control strategies. These data were obtained from a 1983 survey of major gas and electric utilities and state energy offices. None of the data showed changes in temperature settings from before retrofit to after retrofit.

Stovall and Kuliasha (1985) examined electric utility load data for several homes in four utilities. In some cases, indoor temperatures were measured at the same time that total and space heating electricity loads were measured. Although these data show interesting relationships between temperature settings and outdoor temperatures, house type, and heating system type, no pre- vs post-retrofit data were included.

OUTLINE OF PRESENT STUDY

This report discusses changes in indoor temperatures in response to retrofit improvements. The data on which this analysis is based are from an evaluation of the Bonneville Power Administration (BPA) interim Residential Weatherization Program. The BPA program, operated through participating private and public utilities throughout the Pacific Northwest, offered financial assistance (generally a cash rebate) to encourage installation of energy-efficiency improvements to existing homes in the region. These retrofits included attic, wall, floor and heating duct insulation; storm windows and doors; clock thermostats; and caulking and weatherstripping. This program, which operated during 1982 and 1983, weatherized 104 thousand homes at a total cost to BPA of $157 million.

In mid-1983, staff at Oak Ridge National Laboratory and Evaluation Research Corporation began an evaluation of the BPA program. The primary focus of this evaluation was assessment of the actual electricity saving that can be attributed to the program (Hirst et al., 1985). These savings estimates were used to help assess the economic attractiveness of the program to participants, the BPA power system, and the Pacific Northwest region as a whole.

To analyze these issues, several types of data were collected (Fig. 1):

— electric utility bills for samples of participants and nonparticipants, from mid-1981 through mid-1984;

— daily temperature data for each relevant weather station, to match with utility bills to adjust consumption for changes in weather;

— energy audit reports for participants;

— weatherization completion forms for participants;

— household surveys to collect information on demographic, economic, and structure characteristics, on recent conservation measures installed and practices adopted, and on conservation attitudes.

This report analyzes these evaluation data, especially the electricity billing and weather data, to infer changes in indoor temperature settings. Inferred temperature changes are computed for two time periods: from 1981/82 to 1982/83 and from 1982/83 to 1983/84. Eligible nonparticipants are compared with households that participated in the BPA program during 1982 (i.e., those households who received energy audits and cash rebates for installation of retrofit measures in

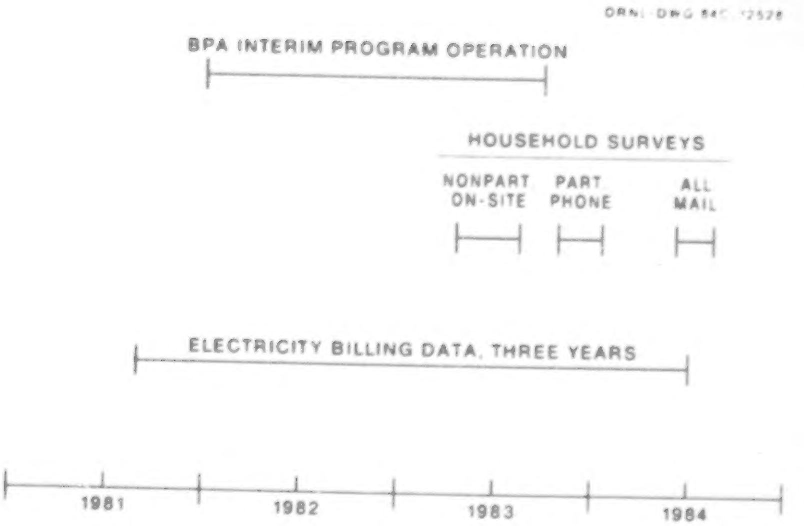
ORNL-DWG 84C-12528
BPA INTERIM PROGRAM OPERATION
HOUSEHOLD SURVEYS
NONPART ON-SITE
PART PHONE
ALL MAIL
ELECTRICITY BILLING DATA, THREE YEARS
1981
1982
1983
1984

Fig. 1. Timing of BPA interim Residential Weatherization Program and ORNL/ERC evaluation.

mid-1982) in terms of indoor temperature changes between the first and second years. The same nonparticipants are compared with 1983 participants with respect to changes between the second and third years. Thus, the data permit examination of pre- and post-retrofit electricity use and indoor temperatures for participants and nonparticipants, for two different periods of participation.

Conducting this analysis with groups that participated in the program in two different years is useful because several exogenous factors changed during this time (Hirst et al., 1985). In particular, the average real (corrected for inflation) price of electricity increased by 29% between years 1 and 2, but only by 12% between years 2 and 3.

Regionwide, incomes decreased slightly (<1%) between years 1 and 2 and then increased by 3% between years 2 and 3. Winter severity, as measured by heating degree days, also varied from year to year: year 1 was 2% colder than the long-run average, year 2 was 5% milder, and year 3 was 3% colder.

The following chapter discusses the methods used to analyze electricity use and to infer changes in indoor temperatures. Chapter 3 presents results of this analysis, using the data noted above and the methods described in Chap. 2. The final chapter presents conclusions concerning these findings.

2. ANALYTICAL APPROACH

The basic unit of analysis is a string of electric utility bills for an individual household covering a 12-month period (called a household-year). Careful analysis of this data can provide a wealth of information and insights concerning the household's electricity use and the components of that total.

PRINCETON SCOREKEEPING METHOD (PRISM)

Fels et al. (1983) developed a simple method to analyze such energy billing data. Their Scorekeeping model performs two important functions. First, it allows identification of the weather-sensitive (primarily space heating) and nonweather-sensitive (baseload) components of household energy use. This permits one to compute normalized annual consumption (NAC) for each household, which represents the household's consumption of energy at long-run weather conditions (i.e., long-run heating degree days, HDD). In addition, PRISM permits adjustment for temporal misalignment across households in fuel bills (e.g., some records begin on July 1 and some begin on July 29; some billing histories have 325 days and others have 376 days).

PRISM assumes that household energy use (electricity in this case) can be split into components - baseload and heating - and that the heating component is directly proportional to HDD:

$$E_{it} = a_i + b_i HDD_{it}(Tref_i) \ , \qquad (1)$$

where E is average daily electricity use for household i during billing period t (usually one or two months). HDD is the number of heating degree days per day (to base temperature Tref) for the same time period as the utility bill, for a weather station close to that household.* The reference temperature is defined as that temperature which yields the highest explanatory power (R^2) in estimation of the above statistical model. Physically, Tref is the outdoor temperature below which the heating system must operate to maintain the desired indoor temperature; i.e., no heating is required at temperatures higher than Tref.

The coefficient a_i (kWh/day) reflects the household's use of energy for nonspace heating purposes. The coefficient b_i (kWh/HDD) reflects use of energy for space heating.

The three parameters (a_i, b_i, $Tref_i$) for each household-year serve two purposes. First, as indicated above, they are used to define NAC:

$$NAC_i = 365*a_i + b_i\overline{HDD}_i(Tref_i) \quad , \qquad (2)$$

where NAC is normalized (weather-adjusted) annual consumption (kWh/year) for household i and $\overline{HDD}$ is the long-run HDD at base $Tref_i$.

In addition, the three parameters** provide a "fingerprint" of the household that can be used to infer several important energy-related characteristics of the structure, its use of heating fuel, and occupant behavior. For example, model outputs can be used to identify households that may be using supplemental fuels for space heating. In addition, model results and original household-year data can be used to identify and correct anomalous outliers. These uses of the Scorekeeping method are discussed in Hirst et al. (1984).

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*Both E and HDD are normalized by the number of days in the billing cycle to correct for differences (especially across utilities) in the number of days per cycle.

**It is important to recognize that the NAC estimate is by far the most stable and robust output from PRISM. That is, estimates of a, b, and Tref are much more uncertain.

CALCULATION OF INDOOR TEMPERATURE CHANGES

For purposes of this report, we examined changes in household electricity use from the preparticipation to the postparticipation period. We examined changes in NAC and its components to identify both the overall change in electricity use after retrofit and the components of that change:

$$NAC_1 - NAC_2 = 365(a_1 - a_2) + [b_1\overline{HDD}(Tref_1) - b_2\overline{HDD}(Tref_2)]\text{ , or}$$
$$DNAC = DBASE + DHEATING\text{ ,} \tag{3}$$

where 1 and 2 refer to the pre- and post-retrofit years, respectively.

Fels and Goldberg (1984) showed how the change in reference temperature (DTref) can be decomposed into three elements related to change in indoor temperature (DTin), change in baseload, and change in thermal performance of the structure. To quote them:

> The temperature [Tref] at which the furnace is first required is lower than the interior temperature [Tin] because part of the heating load is offset by "free heat" [F] from appliances, occupants, and solar gain. The amount of this offset depends also on the house's "lossiness" [L]; the free heat elevates the indoor temperature by the amount (Tin - Tref) = F/L.

Basically, the difference between indoor and reference temperatures is equal to the internal heat gains from insolation, appliances, and body heat divided by the overall heat loss coefficient* (UA) of the building shell. The greater the free heat and/or the smaller the lossiness, the larger will be the difference between the two temperatures.

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*This coefficient depends on both conduction and air infiltration.

If we assume that DF/F can be approximated by Da/a and that DL/L can be approximated by Db/b, then the change in indoor temperature (DTin) can be written as a function of changes in the PRISM parameters (a,b, Tref):

$$\mathrm{DTin} = \mathrm{DTref} + 7^\circ\mathrm{F}*[(\mathrm{Da}/\bar{a}) - \mathrm{Db}/\bar{b})]\ .^{*,**} \qquad (4)$$

The 7° incorporates the traditional assumption that maintenence of a 72°F interior temperature is consistent with a 65°F reference temperature (ASHRAE, 1981).

Several critical assumptions underlie use of this equation for DTin. The first involves the veracity of the 7° difference between indoor and reference temperatures. This difference is not a constant but rather a function of the thermal performance of the building shell and the winter base load. For example, as additional insulation and infiltration reduction measures are added to a house, the difference between the indoor and reference temperature will increase; that is, the heating system will turn on at a lower outdoor temperature for fixed Tin.[†]

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[*] The difference D is defined as $(\ )_1 - (\ )_2$ and the average $(\overline{\ \ })$ is defined as $[(\ )_1 + (\ )_2]/2$.

[**] If Tin - Tref = F/L, then DTin - DTref = DF/L - DL(F/L^2) = (F/L)[DF/F - DL/L] = (Tin - Tref)*[Da/a - Db/b] = 7*[Da/a - Db/b].

[†] Changing the assumed difference from 7° to 9° or from 7° to 5° causes only slight changes in estimated indoor temperatures. These sensitivity runs show that the qualitative conclusions concerning indoor temperature changes after retrofit are robust with respect to changes in the assumed difference between indoor and reference temperatures.

Second, the formula assumes that baseload and DBASE are independent of season. That is, the change in baseload from one year to the next is assumed constant throughout the year. If the reduction in baseload is, for example, greater in the winter, then the effect on DTref will be larger than calculated. Fels et al. (1984) examined the seasonality of baseload consumption for electrically heated homes in Colorado. They found that nonheating electricity use varied, on average, sinusoidally with a winter peak 10% above the mean baseload and a summer minimum 10% below the mean. If the seasonal variation in nonheating electricity use is similar in Pacific Northwest homes, then eqn. 4 is a useful approximation to reality.

Third, we assume that there are no significant changes in the nonappliance portions of free heat (in particular, contributions from building occupants and solar gain) from one year to the next.*

Fourth, the PRISM coefficients (a, b, Tref) are much less stable (i.e., have relatively higher standard errors) than does the overall NAC estimate. This suggests that our analysis of components of change (DHEATING, DTin, etc.) is much more uncertain than our analysis of overall changes in NAC (Chap. 3).

Changes in indoor temperatures affect energy use for space heating through changes in the reference temperature and therefore in long-run HDD. Because:

$$\text{HEATING} = \text{UA}*\overline{\text{HDD}}(\text{Tref}) \ , \tag{5}$$

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*This analysis is limited to homes that use only electricity for space heating. Homes that use wood or other fuels for some of their heating are excluded to avoid complications in interpretation of base load changes.

changes in Tin will affect electricity use according to:

$$DHEATING_{DTin} = UA*(d\overline{HDD}/dTref)*DTref \ . \qquad (6)$$

Because we focus on the changes in Tref due solely to changes in Tin, dTin/dTref = 1. If we assume that b = UA and recognize that the derivative of $\overline{HDD}$ with respect to Tref is equal to the difference $[\overline{HDD}(Tref_2 + 1°) - \overline{HDD}(Tref_2)]$ then we can write:

$$DHEATING_{DTin} = b_2*[HDD\overline{(Tre}f_2 + 1°) - HDD\overline{(Tre}f_2)]*DTin \ . \qquad (7)$$

The first factor on the right hand side of eqn. 7 is the heating slope and reflects the thermal performance of the building and efficiency of its heating equipment.* The second factor represents the sensitivity of long-run HDD to changes in reference temperature.** The last factor is the change in temperature setting, as inferred from PRISM results.

In closing, we note that the analysis outlined in this section uses only two data sources - household electricity billing histories and daily temperature data. Data from the households themselves (for example, on their temperature settings) are not required for the present analysis. We consider this a major strength of the present approach because of known problems with accuracy of household self-reports (see Geller, 1981 and Hirst and Goeltz, 1985).

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*Almost all the electrically heated homes in this analysis use resistance heating, the efficiency of which is constant and near 100%.

**This factor is equal to the number of days during which the space heating equipment operates.

3. RESULTS

DATA SET USED FOR THIS ANALYSIS

We applied the analytical methods discussed in the preceding chapter to particular subsamples of the participant and nonparticipant homes in our evaluation data set. These subsamples include only those homes whose electricity billing data are "clean" and that reported, in household surveys conducted in 1983, that they had no air conditioning equipment and used only electricity as their primary heating fuel. "Clean" billing data refers to PRISM results for both years with $R^2 > 0.75$, a and b coefficients statistically significant at the 10% level or better, and Tref less than the maximum (Hirst, Goeltz, and White, 1984).

The restriction to these nonrepresentative samples of participant and nonparticipant homes is related to the desire to examine indoor temperature changes only in homes that use electricity as the primary heating fuel and that use no other fuels for heating. Interpretation of results for homes that use wood for space heating would be difficult; PRISM estimates of Tref and of changes in Tref, for example, would be confounded by changes in wood use (as well as changes in thermal integrity of the house shell and in indoor temperature settings). It is also important, for purposes of this analysis, to restrict attention to households whose billing data closely correspond to PRISM.

The evaluation data set includes 1602 homes with usable electricity billing data (Table 1). Information on household demographics and structure characteristics, obtained from the 1983 household surveys, is available for 84% of these households. Restricting attention to only those households with clean billing data (i.e., billing data that closely conforms to PRISM, denoted by Goodfit) eliminates another 25% of the original data set. Eliminating households that report electric air conditioners and/or use of fuels other than electricity for heating leaves only 15% of the original households (Primefit). The loss of 75% of the Goodfit households (lower part of Table 1) is due partly to lack of a household survey (nonresponse) or presence of air conditioning equipment, but primarily to use of fuels other than electricity for heating.

Thus, results presented here are not representative of homes throughout the Pacific Northwest. The 242 households examined in this study are a carefully selected subset of households in the Northwest - those that use only electricity for space heating and do not use

Table 1. Household attrition from evaluation data set in analysis of indoor temperature changes

Group definition	Group			
	Participants		Nonparticipants	Total
	1982	1983		
Usable electricity billing data	602	612	388	1602
1983 household survey	464	509	472	1445
Both bills + survey	457	484	388	1329
"Clean" billing data (Goodfit)	405	374	172	951
Present data set (Primefit)	97	113	32	242
Reasons for attritition between Goodfit and Primefit				
No household survey	97	70	0	167
Air conditioning equipment	69	31	55	155
Non-electric heating fuel				
year 1	28	151	10	189
year 2	114	9	75	198

electricity for air conditioning. (The Appendix compares results between the subset of households used here and the full evaluation data set.)

1982 PARTICIPANTS AND NONPARTICIPANTS

Electricity use and changes

Preprogram electricity use for the 1982 participants is almost 10% higher than that for the nonparticipants (Tables 2 and 3):* 27,000 vs 24,700 kWh/year. Space heating accounts for about 55% of the total for both groups.

Not surprisingly, the reduction in annual electricity use is much greater for participants than for nonparticipants: 4300 vs 1300 kWh/year (Figs. 2 and 3). About 4% of the participants increased electricity use and 4% saved more than 10,000 kWh; comparable figures for the nonparticipants are 30% and 0%. These differences are surely due largely to the retrofit measures installed as part of the BPA program.** This assumption is confirmed by the much larger decline in space heating electricity use for participants and the nearly equal decline in baseload electricity use; the primary focus of the BPA program is on installation of measures that reduce space heating electricity use. Total one-year electricity savings for both groups are highly statistically significant (1% level or better); so too is the

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*Both medians (Table 3) and means (Table 2) are shown because of the large variation across homes. Medians are more robust with respect to a few large outliers than are means.

**The average cost of retrofit measures installed by the program in the homes of 1982 participants was almost $1600.

Table 2. Summary statistics (means) on annual electricity use and savings for nonparticipants and participants in the BPA interim program[a]

	Group		
	Audit + buyback		Nonparticipant
	1982	1983	
Year 1 (1981/82)			
Baseload	11,900		11,600
Heating	15,100		13,100
Total	27,000		24,700
Reference temperature	58.9		57.7
Year 2 (1982/83)			
Baseload	11,500	11,600	11,300
Heating	11,200	15,000	12,100
Total	22,700	26,600	23,400
Reference temperature	58.1	57.8	57.3
Differences (1981/82 - 1982/83)[b]			
Baseload	400		300
Heating	3,900[c]		1,000
Total[d]	4,300[c]		1,300[c]
Reference temperature	0.8[e]		0.4
Indoor temperature	-0.4		-0.2
Saving because of change in indoor temperature	-200		-400
Year 3 (1983/84)			
Baseload		11,500	10,500
Heating		11,600	13,100
Total		23,100	23,600
Reference temperature		57.5	58.0
Differences (1982/83 - 1983/84)[b]			
Baseload		100	700
Heating[d]		3,400[c]	-1,000[e]
Total[d]		3,500[c]	-300
Reference temperature		0.4	-0.6
Indoor temperature		-1.1[e]	-0.3
Saving because of change in indoor temperature		-1,200[e]	0

[a] All figures are in kWh/year except for the temperature figures, which are in °F.

[b] Positive values represent an energy saving or a temperature decrease.

[c] Mean value is statistically significant at the 1% level.

[d] Difference between the participant and nonparticipant means is statistically significant at the 1% level.

[e] Mean value is statistically significant at the 10% level.

Source: Monthly or bimonthly electricity bills for 97 households that participated in the BPA program in 1982, 113 households that participated in 1983, and 32 nonparticipant households.

Table 3. Summary statistics (medians) on annual electricity use and savings for nonparticipants and participants in the BPA interim program[a]

	Group		
	Audit + buyback		Nonpar-ticipant
	1982	1983	
Year 1 (1981/82)			
Baseload	11,900		9,400
Heating	14,500		11,700
Total	25,400		23,800
Reference temperature	60		57
Year 2 (1982/83)			
Baseload	11,500	10,400	11,600
Heating	10,000	13,500	11,700
Total	21,800	23,400	23,100
Reference temperature	58	58	57
Differences (1981/82 - 1982/83)[b]			
Baseload	400		200
Heating	3,800		1,300
Total	3,900		900
Reference temperature[c]	1		0
Indoor temperature	-0.4		0.2
Saving because of change in indoor temperature	-300		200
Year 3 (1983/84)			
Baseload		10,600	10,900
Heating		10,200	11,800
Total		21,000	22,800
Reference temperature		57	57
Differences (1982/83 - 1983/84)[b]			
Baseload		200	600
Heating		3,200	-100
Total		2,900	-200
Reference temperature[c]		0	0
Indoor temperature		-1.5	-0.2
Saving because of change in indoor temperature		-1,200	-300

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[a] All figures are in kWh/year except for the temperature figures, which are in °F.

[b] Positive values represent an energy saving or a temperature decrease.

[c] The method used here searches for the best Tref in one degree increments. Thus, the median changes are in integers (either zero or one).

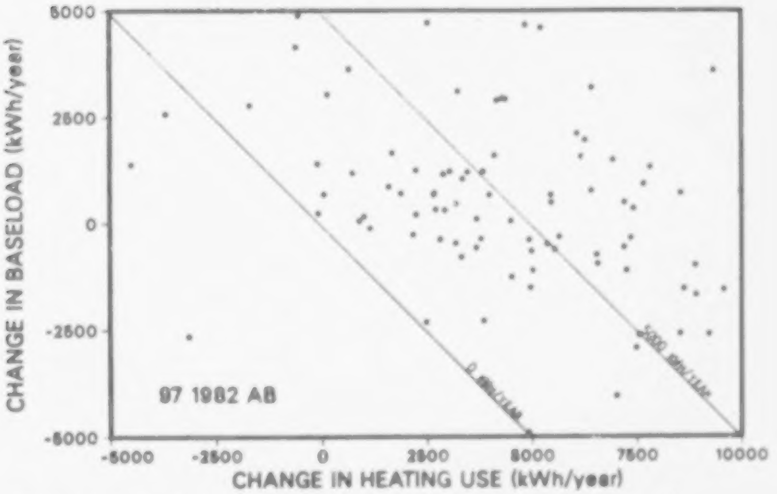

Fig. 2. Reduction in baseload electricity use as a function of reduction in space heating electricity use (1981/82 - 1982/83) for households that participated in the BPA program in 1982. The correlation coefficient (r) between change in baseload and heating uses is -0.55.

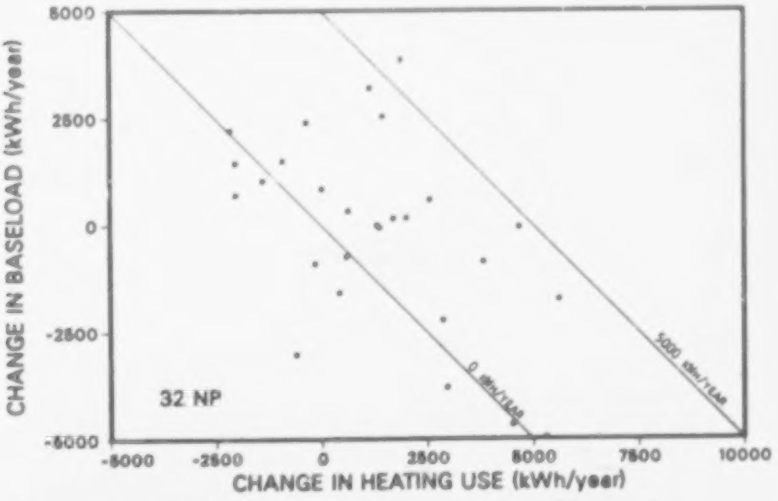

Fig. 3. Reduction in baseload electricity use as a function of reduction in space heating electricity use (1981/82 - 1982/83) for households that did not participate in the BPA program. The correlation coefficient (r) between change in baseload and heating uses is -0.76.

space heating electricity savings for participants and the difference in total saving between the two groups.

Reference temperatures in both groups (57 - 59°F) were below the traditional balance point of 65°F. This suggests that these households had substantially lower indoor temperatures than the conventional assumption of 72°F, by about 7°F.*

Indoor temperature changes

Scorekeeping model results show that the reference temperature dropped an average of 0.8°F in participant homes and 0.4°F in nonparticipant homes between years 1 and 2. Improvements in the thermal performance of participant homes account for an average 1.6° drop in reference temperature; the comparable drop in nonparticipant homes is only 0.5°. This reduction is partly offset by a reduction in baseload in participant homes, which would increase reference temperatures an average 0.3° in participant homes (0° in nonparticipant homes). Thus, on balance, PRISM results (eqn. 4) imply a 0.4°F increase in indoor temperatures for participants, compared to a 0.2°F increase for nonparticipants (Fig.4).** Neither mean increase in indoor temperature is statistically significant. It is unclear whether the large variation in indoor temperature changes is due to limitations in the analytical method used here or due to actual differences among households in postretrofit behavior.

The calculated increase in indoor temperatures leads to an increase in electricity use (relative to what would have occurred if temperature settings had remained constant). On average, this takeback effect (eqn. 7) cost participants an estimated 200 kWh/year and nonparticipants 400 kWh/year. Thus, approximately 5% [200/(200+3900), Table 2] of the space heating electricity saving for participants is lost because of their behavioral response to installation of retrofit measures. Similarly, nonparticipant behavior accounts for a 29% [400/(400+1000)] loss of their space heating electricity savings. As with the increases in indoor temperature, these takeback effects are not statistically significant.

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*An alternative explanation is that these homes were all reasonably well insulated.

**-0.42 = 0.83+0.32-1.57 for participants, and -0.18 = 0.38-0.04-0.52 for nonparticipants, using eqn. 4.

The very large variation across households in estimated indoor temperature changes (Fig. 4) suggests considerable caution in interpreting these findings. For example, the standard deviation of the electricity

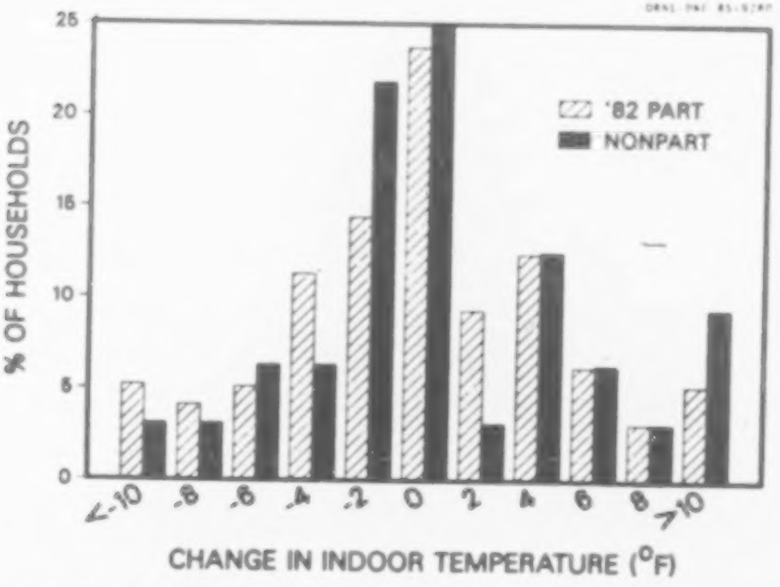

Fig. 4. Distribution of changes in computed indoor air temperatures between 1981/82 and 1982/83 for 1982 participants and nonparticipants.

loss due to the takeback effect is 50% greater than the standard deviation for total electricity saving (4900 vs 3300 kWh/year).

The medians (Table 3) show the same average increase in indoor temperature for the participants (0.4°F) and a slight decline (0.2°F) for the nonparticipants (rather than the 0.2°F increase suggested by the mean value, Table 2). The medians show an electricity loss for participants due to the takeback effect of 300 kWh, compared with an additional saving of 200 kWh for the nonparticipants.

The means and medians paint a consistent picture of indoor temperature changes for program participants - a slight increase in temperatures after retrofit, which leads to a small loss of the space heating energy savings due to the retrofit measures installed in their homes. These statistics show very small, but qualitatively different, results for the nonparticipants. These differences probably occur because the number of nonparticipants in this analysis is so few (32) and because their average change in temperature setting is quite small.

Despite the differences between means and medians, they both imply that participants increased indoor temperatures by more than did nonparticipants, although the difference is not statistically significant. We next examine comparable changes between years 2 and 3 for the 1983 participants and the nonparticipants.

1983 PARTICIPANTS AND NONPARTICIPANTS

Electricity use and changes

Preprogram electricity use for the 1983 participants is almost 15% higher than that for the nonparticipants (Table 2): 26,600 vs 23,400 kWh/year. Space heating accounts for about 55% of the total for both groups.

Again, the reduction in annual electricity use between years 2 and 3 is much greater for participants than for nonparticipants: 3500 vs -300 kWh/year. About 10% of the participants and more than half the nonparticipants (54%) increased electricity use; about 8% of the participants and none of the nonparticipants saved more than 10,000 kWh/year. These differences, once again, are due largely to the retrofit measures installed as part of the BPA Residential Weatherization Program.* This is confirmed by the much larger decline in space heating electricity use for participants (3400 vs -1000 kWh/year) and the much smaller decline in baseload electricity use (100 vs 700 kWh/year); see Figs. 5 and 6. As was true for the prior comparison of 1982 participants and nonparticipants, the space heat and total savings for participants are statistically significant; so too is the difference in total saving between the two groups.

Electricity savings, for both groups, are lower than are the savings between years 1 and 2 (Tables 2 and 3). Although nonparticipants cut electricity use by an average of 1300 kWh/year between years 1 and 2, their average use increased by 300 kWh/year between years 2 and 3. These differences are primarily due to changes in electricity price and household income (Appendix C of Hirst et al., 1985).

Reference temperatures in both groups of homes (57 - 58°F) were substantially below the traditional balance point of 65°F.

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* The average cost of retrofit measures installed by the program in the homes of 1983 participants was almost $1800.

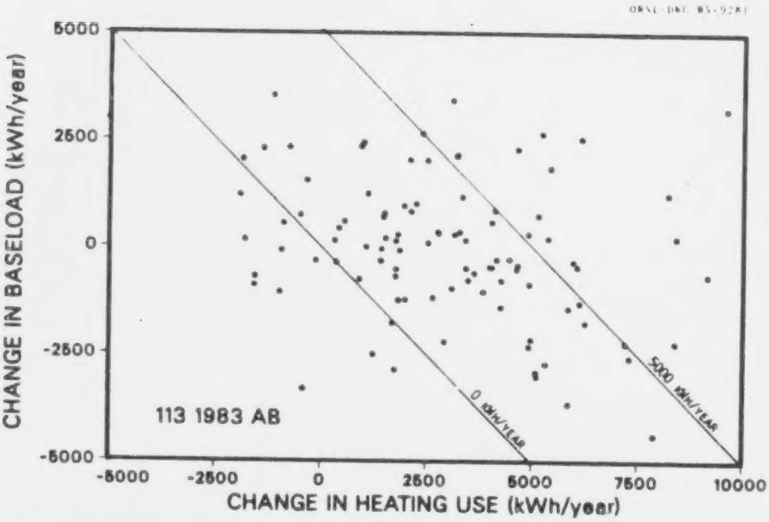

Fig. 5. Reduction in baseload electricity use as a function of reduction in space heating electricity use (1982/83 - 1983/84) for households that participated in the BPA program in 1983. The correlation coefficient (r) between change in baseload and heating uses is -0.43.

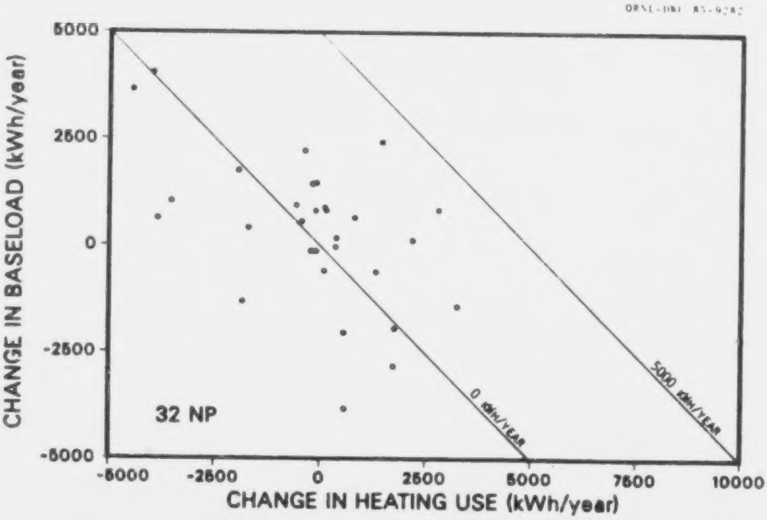

Fig. 6. Reduction in baseload electricity use as a function of reduction in space heating electricity use (1982/83 - 1983/84) for households that did not participate in the BPA program. The correlation coefficient (r) between change in baseload and heating uses is -0.54.

Indoor temperature changes

PRISM model results show that the reference temperature dropped an average of 0.4°F in participant homes and increased 0.6°F in nonparticipant homes between years 2 and 3. Results also show an estimated 1.1°F increase in indoor temperature for participants (significant at the 2% level), compared to a 0.3°F increase for nonparticipants (Fig. 7). Again, participants increased their indoor temperatures by more than did nonparticipants.

The calculated increase in indoor temperatures leads to an increase in electricity use (relative to what would have occurred if temperature settings had remained constant). On average, this takeback effect cost participants an estimated 1200 kWh/year but did not affect nonparticipant

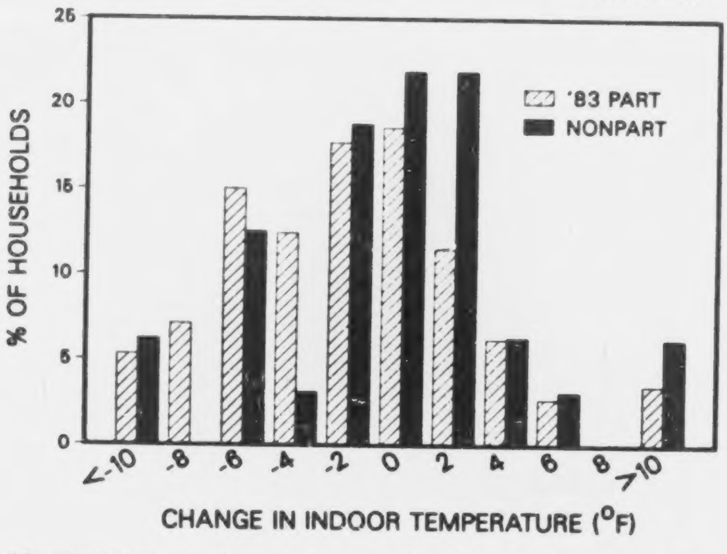

Fig. 7. Distribution of changes in computed indoor air temperatures between 1982/83 and 1983/84 for 1983 participants and nonparticipants.

electricity use. Thus, 26% [1200/(1200+3400), Table 2] of the total space heating electricity saving for 1983 participants is lost because of their behavioral response to installation of retrofit measures.

Again, there is substantial variation across households in estimated indoor temperature changes (Fig. 7), which suggests caution in interpreting these findings. The medians show a slightly larger increase in indoor temperature for the participants (1.5°F) and a slightly smaller increase (0.2°F) for the nonparticipants. The medians show an electricity loss for participants due to the takeback effect of 1200 kWh, compared with a loss of 300 kWh for the nonparticipants.

The means and medians both show a substantial (greater than 1°F) increase in indoor temperature after retrofit for the 1983 BPA program participants. Nonparticipants increased their indoor temperatures by much less, roughly 1/4°F. Thus, the two sets of comparisons - 1982 participants vs nonparticipants and 1983 participants vs nonparticipants - yield qualitatively similar findings. In both comparisons, the participants increased indoor temperatures after retrofit, and did so by more than the nonparticipants. The difference, however, is more pronounced for the 1983 participants than for the 1982 participants.

COMPONENTS OF ELECTRICITY SAVINGS

We next examined the relationships between total electricity savings and takeback effect for the 1982 and 1983 participants. We did not analyze the nonparticipant savings in this fashion because there were so few nonparticipant households in this data set.

There was no statistically significant correlation between indoor temperature change and total electricity saving for the 1982 participants. However, there was a significant and positive correlation between indoor temperature change and total electricity saving for the 1983 participants (r = 0.20, significant at the 4% level); similarly the correlation between the energy lost due to the takeback effect and total electricity saving (Fig. 8) was significant (r = -0.23, 1% level).

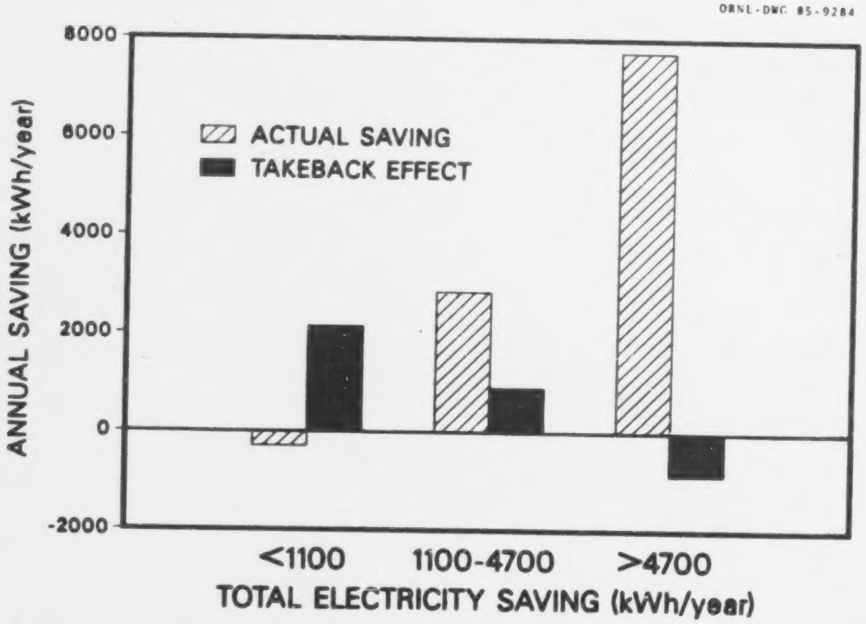

Fig. 8. Actual electricity saving and its components for 113 households that participated in the BPA program in 1983. The households are split into three groups by total saving: bottom 25%, middle 50%, and top 25%. (A similar figure for the 1982 participants is not presented because the results show virtually no relationship between total saving and takeback effect.)

The 1983 participant homes whose actual electricity savings were in the bottom 25% of the distribution (mean saving of -300 kWh/year) also had the largest increase in indoor temperature setting (2.7°F) and, consequently, the greatest lost saving because of the takeback effect (2100 kWh/year). The middle 50%, whose mean saving was 2900 kWh, increased their indoor temperatures by an average of 1.3°F, which led to a takeback loss of 900 kWh/year. The top 25%, whose mean saving was 7700 kWh, reduced indoor temperatures after retrofit by an average of 0.2°F, which led to a takeback saving of 900 kWh. To summarize, the homes with the largest electricity saving lowered their thermostats (and saved more electricity) after retrofit; homes with the smallest (negative) savings did just the opposite. These correlations show that, for the 1983 participants, but not the 1982 participants,* homes that experience small energy savings do so in part because of behavioral changes made after retrofit.**

We also examined the relationship between electricity saving and preprogram electricity use. There is a strong positive relationship between actual saving and preretrofit use. The relationship between baseload saving and total saving is positive, but weak. On the other hand, heating saving and total saving are strongly correlated. That is, only the space heating electricity savings are closely related to preprogram electricity use. Finally, there is no relationship between changes in indoor temperature and preprogram electricity use.

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*We are not sure why the expected relationship between indoor temperature changes and actual electricity saving was not observed for the 1982 participants. Perhaps, their small average change in temperature (0.4° vs 1.1° for the 1983 participants) obscured the underlying relationship.

**Alternatively, homes in which many retrofit measures were installed are likely to be more comfortable at lower indoor temperatures, because increased insulation reduces radiant heat transfer between the occupants and the walls of the house and may also reduce infiltration (drafts). In general, the energy savings due to retrofit might affect indoor temperature settings through at least three mechanisms: radiant and convective heat transfer, a psychological sense of control over one's fuel bills (leading to lower temperatures), and an economic response (leading to higher temperatures).

4. CONCLUSIONS

The extent to which actual energy savings after retrofit correspond to the estimates prepared by home energy auditors is an important and hotly discussed issue. Limited evidence suggests that, on average, actual energy savings are less than that predicted in energy audits. Perhaps more important, there is enormous variation across households in their actual energy savings and in the relationship between predicted and actual savings.

Many factors may account for these large differences: errors in audit methodologies, errors in auditor data collection and interpretation, installation of inappropriate retrofit measures, use of poor quality retrofit materials, sloppy installation of measures, changes in occupant energy-related behavior after retrofit, errors in electricity billing data, and errors in methods used to analyze electricity-use data. Unfortunately, little is known about the importance of these factors.

Occupant behavior is likely to be an important determinant of actual energy savings, primarily because small changes in such behaviors can have large effects on household energy use. For example, a 2°F reduction in indoor temperature will cut annual space heating energy use by about 10% in regions of the U.S. with 5000 heating degree days (65°F base).

This report analyzed electricity billing data for 242 homes in terms of estimated changes in indoor temperature settings. Two hundred ten of these homes received free energy audits and financial assistance from the Bonneville Power Administration for retrofit improvements (e.g., attic insulation, storm windows, caulking and weatherstripping), as part of the BPA Residential Weatherization Program. Of the 210 program participants, 97 received assistance in mid-1982 and 113 participated in mid-1983. The remaining 32 homes were eligible for the program but did not participate.

Before summarizing results of this analysis, it is important to emphasize the speculative nature of the findings. Estimates of changes in indoor temperatures and of space heating electricity use induced by these temperature changes are approximate. They are based on analysis of electricity billing data only; that is, neither household surveys nor independent measurements of indoor temperatures are included in this study. Imputation of indoor temperature changes from electricity use data alone requires strong assumptions. Further, the results obtained with the method show large variation across households. Finally, the results are based on small nonrandom samples of participants and eligible nonparticipants for the BPA Residential Weatherization Program. Nevertheless, these results are worth reporting because, as far as we can determine, no other empirical data exists with which to assess the effects of residential retrofits on subsequent changes in indoor air temperatures.

The analysis of billing data showed a mean reduction in annual electricity use of 4300 kWh (median saving of 3900 kWh) for the 1982 participants and a mean saving of 3500 kWh (median of 2900 kWh) for the 1983 participants. These homes were retrofit during mid-1982 or mid-1983 at an average cost of $1700; the billing data include the pre- and post-retrofit years.

Reductions in space heating energy use (as opposed to baseload use) accounted for more than 90% of the total saving in these homes. This is consistent with our expectation that the observed savings were primarily due to the BPA-financed retrofits.

The nonparticipants had much smaller electricity savings: mean savings of 1300 and -300 kWh (median savings of 900 and -200 kWh) between years 1 and 2 and between years 2 and 3, respectively.

The data and PRISM results suggest average increases in indoor air temperatures after retrofit, of 0.4°F for the 1982 participants and 1.3°F for the 1983 participants. These temperature increases imply a loss of 200 kWh for the 1982 participants and 1200 kWh for the 1983 participants of electricity saving. This is equivalent to 5% and 25%, respectively, of the space heating energy saving due to the technical efficiency improvements (retrofits). Nonparticipants had smaller increases in indoor temperatures than did the participants during both time periods, by 0.4 - 1°F. Because these average changes in indoor temperatures are small and the variation across households is large, these results should be viewed cautiously.

In our view, the qualitative result obtained here — that households, on average, slightly increase temperature settings after retrofit — is probably correct. However, the exact numbers may not be.

The paucity of data on measured changes in indoor air temperatures and the possible importance of the take back phenomenon argue for more data collection and analysis. The ongoing Hood River Conservation Project in Oregon involves collection of detailed monitoring data on 320 homes (Pacific Power and Light, 1983). The data being collected include total, space heating, and water heating electricity uses, and indoor air temperatures; these data will be collected for a year before retrofit (1984/85) and a year after retrofit (1985/86). These detailed data, when combined with weather data, household survey responses, and information on measures installed will permit careful analysis of the relationship between efficiency improvements and household behavior.

ACKNOWLEDGMENTS

We are grateful to Richard Goeltz for his considerable assistance in creating and organizing this data base. We thank Linda Berry, Tim Dunsworth, Margaret Fels, Richard Goeltz, Miriam Goldberg, Kenneth Keating, William Mixon, and Thomas Potter for their helpful comments on a draft of this report. We thank Marjie Hubbard for typing the draft and final versions of the report.

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APPENDIX
COMPARISON OF RESULTS WITH DIFFERENT DATA SUBSETS

The samples of households used in analysis of changes in indoor temperatures were selected using stringent criteria. As a consequence, these nonrandom samples are not representative of households throughout the Pacific Northwest.

This Appendix presents statistics obtained with three different data sets: the original set of 1602 households for which usable billing data were obtained, the subset of 951 households with "clean" billing data, and the subset of 242 households with both clean billing data and survey responses that showed use of no fuels other than electricity for space heating and no air conditioning equipment (the subset used in the present analysis).

Comparison of reductions in total electricity use across data sets (Table A-1) shows some variation. However, the variation in change in indoor temperature is far greater.

Comparison of the standard deviations for these two measures (change in electricity use and in indoor temperature) shows even more starkly the differences among these data sets. The standard deviation of electricity saving declines slightly as the sample size gets smaller and "cleaner," from 4600 to 3300 kWh for the 1982 participants, for example. The decline in standard deviation for the change in indoor temperature is much more dramatic, from about 30 to 5°F.

These comparisons illustrate two points. First, the subsamples used in the present analysis differ from the overall samples selected for evaluation of the BPA Residential Weatherization Program. Second, use of these carefully selected subsamples greatly reduces the standard deviation of the variable of greatest interest in this study, indoor temperature changes.

Table A-1. Comparison of Scorekeeping model results, by sample

Group/ results[a]	Means (standard deviations in parentheses), by group		
	Participants	Nonparticipants	No. of households
All households			1602
1982 differences			
Electricity use	5160 (4570)	1710 (4400)	
Indoor temperature	21.2 (577.3)	-1.3 (16.9)	
1983 differences			
Electricity use	2790 (3750)	-20 (3620)	
Indoor temperature	-2.6 (25.6)	-1.7 (18.8)	
Clean data			951
1982 differences			
Electricity use	5210 (4010)	360 (2960)	
Indoor temperature	-0.5 (7.5)	0.1 (7.0)	
1983 differences			
Electricity use	3030 (3410)	520 (2520)	
Indoor temperature	-2.0 (7.2)	-0.3 (7.0)	
Present data set			242
1982 differences			
Electricity use	4300 (3260)	1330 (2410)	
Indoor temperature	-0.4 (5.5)	-0.2 (4.5)	
1983 differences			
Electricity use	3460 (3630)	-280 (2000)	
Indoor temperature	-1.1 (5.1)	-0.3 (5.5)	

[a] All differences refer to one-year changes (1981/82 - 1982/83 or 1982/83 - 1983/84).

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Senator **Evans**. Senator Nickles.

Senator **Nickles**. Thank you, Senator Evans. I appreciate your interest in this legislation and as chairman of this committee, I have an interest in it. I also have an interest, Mr. Streb, in your comments, particularly in the standards and also in regulations.

I also would say as just a beginning comment, I am very apprehensive about government relations in these fields, whether it apply to automobile CAFE standards. And Senator Evans and I have been on opposite sides of that issue.

On appliance standards, as called for in this legislation, of interest is that there has been, as I understand—and I apologize for not being here at the earlier part of the hearing—but it is my understanding that most of the major players have somewhat agreed to have agreed to this legislation. I didn't make or hear your original comments. I was reviewing your statement.

Could you possibly just summarize real quickly what your objections to the legislations might be? Did you have specific problems with it that you would like to see the committee change or just philosophically would rather not see any legislation dealing with the regs?

Mr. **Streb**. Senator Nickles, I think it goes back to the basic position that the Department has taken, that it supports the repeal of the original legislation which imposes the appliance standards. It continues to stick to that position.

With respect to the proposed legislation, the administration has taken the position of nonsupport in favor of continuing to strongly support the original position taken of simply repealing all appliance standards legislation.

Senator **Nickles**. Let me ask you a question. Just from the aspect of interstate commerce about the fact that maybe one State or another State might have different requirements that could impede interstate commerce—in other words, if you had a major manufacturer—if we had, say, a Whirlpool manufacturer in our State who were manufacturing products nationwide. But if you had changing State laws where there would be different requirements in different States, would that be impeding interstate commerce?

Is that consistent or not consistent? I am kind of wrestling with that question in my mind.

Mr. **Streb**. We recognize the burdensome nature of drastically different standards in various States, in particular in adjoining States.

We have suggested, and it is suggested in the testimony that I presented, that that problem may be remedied by the broad scale adoption of guidelines which would be generated by a professional society, particularly ASHRAE, which has, in fact, already developed some guidelines in this regard, as far as the building standards of those States. And that way I think you could achieve the degree of uniformity that the appliance manufacturers would like to have.

Senator **Nickles**. You could achieve that with that consensus by whatever group—what group did you mention?

Mr. **Streb**. I mentioned ASHRAE. There are other professional societies. That is the American Society of Heating, Refrigerating, and Airconditioning Engineers.

Senator Nickles. But that wouldn't have the effect, though, of overriding State law, would it?

Mr. Streb. No, no. The States would have to adopt that. ASHRAE merely develops standards which are consensus standards that are developed for use on a voluntary basis by States or municipalities or any other group.

Senator Nickles. The legislation—correct me, Senator Evans, you can chime in here, too. The legislation set the standards for these 11 different groups; is that called for in the legislation?

Mr. Streb. The proposed legislation, which is before this committee today, actually sets standards for 11 appliances; that is correct.

Senator Nickles. Are those standards, as called for in the legislation, reasonable? I guess they must be to some extent, if they are agreed upon by most of the manufacturers and players in this issue.

Mr. Streb. It is our assessment that the standards that have been proposed are either reasonable or nonsubstantive, meaning that in a few cases they really have very little meaning. But they are reasonable.

Senator Nickles. And then the legislation also calls for those standards to be reanalyzed, on a periodic basis, by the Secretary; is that correct?

Mr. Streb. The reanalysis on a very specific schedule that is established by law, which is considerably more burdensome than the current law, would require reanalysis by the Department within 5 years from the establishment of the first standards and then from time to time thereafter, without being specific as to the need.

This does, in fact, set up a schedule for each of the appliances.

Senator Nickles. So you could have a situation—who knows what the energy situation would be 5 years from now, but let's say if we got into one, we will have a different administration and two, we will probably have a different energy scenario than we have right now—I hope we do to some extent—that the Secretary at that time may say, "Well, we need to be much more frugal or much more conservative in our energy conservation efforts. We must try and reduce further energy consumption so they would try and change those standards, say, by across the board 20 percent? Would that be one option under this legislation?

Mr. Streb. Mr. Nickles, you are referring to the current legislation?

Senator Nickles. The legislation pending before the Committee.

Mr. Streb. I believe that you are correct. One would have to examine the schedule for each and every appliance. The reanalysis schedule for air conditioners, for example, is different from that for furnaces. But following that schedule at the time the reanalysis came up, the Secretary would have to make a determination as to whether the standard, as had originally been proposed, was still appropriate or whether it should be made tougher.

Senator Nickles. And then the Secretary would have that discretion?

Mr. Streb. That is correct.

Senator Nickles. I am asking these questions in trying to become more familiar with the legislation. I appreciate your input.

Did you have anything to do with the CAFE standards?

Mr. STREB. No, sir; that is administered by the Department of Transportation.

Senator NICKLES. We wrestled with that issue. And again, I take issue sometimes when Congress and/or administrative bureaucracies try and set up arbitrary standards many years in advance, trying to guess what they think would be appropriate. And then we find that conditions change. And sometimes those conditions and standards can cost jobs and inefficiencies. They can cost a lot of money.

Do you see these standards as proposed as being increasing the cost of these appliances to consumers?

Mr. STREB. We believe that they would have the impact of increasing the cost of the least costly appliances, essentially removing from the marketplace the cheapest appliances that are on the market.

Senator NICKLES. Those cheapest appliances being the ones that are least energy-efficient?

Mr. STREB. Correct.

Senator NICKLES. Is that a significant part of the market today?

Mr. STREB. I believe that it is a significant part of the market.

Senator NICKLES. Mr. Chairman, are those manufacturers of those cheaper items, are they represented today?

Senator EVANS. I believe so. I believe that each of the manufacturers—manufacturers of wide range of appliances that covers the entire field.

Earlier testimony today indicated, in response to questions, that as manufacturers focus on more energy-efficient appliances, they may well find ways to do it that are less rather than more expensive and that you get both the benefit of less energy use and cheaper appliances.

I think that it is safe to say that what appears to be cheapest may not be cheapest today. The initial cost may be somewhat cheaper—the energy cost to operate during the lifecycle of that appliance may make it considerably more costly than a more efficient appliance that may cost more to begin with.

And I think that is what is leading to an increasing use of energy-efficient appliances.

Senator NICKLES. Mr. Streb, in your information have you talked to groups—I am just wondering—manufacturers or others that feel like this would be detrimental to their industry or to their product line or to their employees?

Mr. STREB. Members of my staff have talked to many of the appliance manufacturers. Personally, I am not aware that any of them have indicated that would be detrimental; however, most of the appliance manufacturers basically support the position that we have taken that we would all be better off without any regulation.

But they, at the same time, need to cope with the situation that they have in which they refer to dealing with a patchwork quilt of regulation, which is different from State to State.

And for that reason, they support this legislation.

Senator NICKLES. Primarily because of the State preemption?

Mr. STREB. Correct.

Senator NICKLES. I appreciate your comments and, Senator Evans, I appreciate your chairing the hearing today.

Senator Evans: Thank you very much, Senator.

I might just say in passing that eons ago, when I was actively engaged as a consulting engineer in the structural field, I had considerable to do with building codes from various States as well as from various communities. And I think the concept or the idea that somehow we could gain nicely regionalized and consistent national and regional voluntary standards to be applied to the building codes of various States is maybe something to be wished.

But the chance of that ever happening are extraordinarily remote. I might just suggest that that is not a very feasible alternative in my view. It is hard enough to try to find consistency in building codes from county to county and from city to city within a State, much less find consistency between States and the idea that somehow miraculously in this one field we would find consistency across the Nation is, I think, beyond imagination. I would suggest that that is not a very good or not a very practical suggestion. We all devoutly wish that it could be, but I am afraid it can't be.

With that, we thank you very much for your testimony and we will now turn to panel No. 3, Mr. T. Milton Honea, president, Arkansas Louisiana Gas Co., representing American Gas Association; Mr. Stephen Wiel, commissioner, Nevada Public Service Commission, representing National Association of Regulatory Utility Commissioners; and Mr. Tom Morron, vice president, customer services and marketing, Edison Electric Institute.

Senator Evans. Please go ahead, Mr. Honea.

STATEMENT OF MILT HONEA, PRESIDENT, ARKANSAS LOUISIANA GAS CO., ON BEHALF OF THE AMERICAN GAS ASSOCIATION: ACCOMPANIED BY KENNETH CUCCINELLI, VICE PRESIDENT, MARKETING, AMERICAN GAS ASSOCIATION

Mr. Honea. Thank you, Senator Evans. I am Milt Honea, the president of Arkansas Louisiana Gas Co. Our company is a gas distributor covering 730,000 customers in the States of Oklahoma, Kansas, Arkansas, Louisiana, and Texas. We also have an interstate pipeline company. I am here today to present the views of the American Gas Association on S. 2781.

A.G.A. is a national trade association whose 300 natural gas distribution and transmission members serve over 85 percent of the Nation's house-heating customers. The gas industry as a whole serves more than 160 million Americans in all our 50 States.

We wholeheartedly support the concept of this act, which seeks to set minimum efficiencies for household appliances and heating equipment. A.G.A.'s interest in appliance efficiency springs from our belief that wise use of energy is in the best interest of our customers as well as all consumers. While we favor the intent of this legislation, we would like to call your attention to one or two provisions, which we think could be improved.

First, the minimum efficiency proposed for gas furnaces of 78-percent AFUE would impose a financial burden on consumers, particularly on those who live in smaller homes with furnaces of 50,000 BTU per hour and less.

The bill would, for all practical purposes, eliminate atmospherically vented furnaces. An induced draft system is usually required for a furnace to achieve 78-percent AFUE and since the AFUE for midefficiency furnaces ranges from 71 to 80 percent today, the bulk of conventional noninduced draft furnaces will not satisfy the requirements of the act.

The increased cost of going to a 78-percent AFUE over a 71-percent limit could easily reach another $250 per unit. Despite the fact that the improved efficiency units would save some energy, they would not significantly reduce the heating bills and would require an unusually long time for payback for the homeowner.

In most cases the payback on the increased cost would extend beyond 8 to 10 years. And in our part of the country, it would reach more like 17 years.

Second, electric resistance heating equipment, which can be used on a stand-alone basis or as a backup to most heat pump systems, has no efficiency factor prescribed in these standards, even though this form of heating is the least efficient of all.

By virtue of the very low initial cost of this equipment, we are fearful that this expensive heat source may inadvertently become an even more attractive heating alternative because of this legislation. And this is especially true for low-income families who may be enticed into this form of heating because of the low initial cost. And their use of electricity in this regard would conflict with the stated intent of the act, which namely is to save customer's money by reducing the need for additional electric generating plants.

To illustrate my point, a 1,000-square-foot home in our area of the country, using a 50,000-btu-per hour furnace, rated at 71 percent efficiency, would result in an annual heating bill of around $145.

If we substituted a 78-percent furnace, the heating cost would drop to around $130. And that $15 annual savings would result in a 17-year payback on the added investment for that homeowner.

Now, contrasting with this, the homeowner could spend less initial investment to get an electric resistance heating unit, but unfortunately later, their heat bill would go up closer to $400 per unit.

Finally, in setting up performance standards for electric heat pumps, this legislation addresses the cooling efficiency side with an SEER, but the heating efficiency rating for heat pumps is not addressed. And because a large part of the annual operation of the heat pump is for heating, we raise the question of whether a minimum standard should not be proposed for this equipment and its supplemental heating, such as the electric resistance equipment.

However, in the interest of reaching a compromise and as a reflection on our overriding desire to see S. 2781 enacted, we are proposing only an amended that sets a more reasonable minimum for smaller furnaces. Specifically, we have proposed a 71-percent AFUE for furnaces up to 50,000 btu's or, in the alternative, a flat waiver of the efficiency standard for furnaces below 45,000 Btu's.

Because of the potential favorable impact of this bill, we do ask your careful consideration of the act, and we do urge you to pass immediately with this amendment.

Thank you.

[The prepared statement of Mr. Honea follows:]

TESTIMONY OF
MILT HONEA,
PRESIDENT AND CHIEF OPERATING OFFICER,
ARKANSAS LOUISIANA GAS COMPANY
ON BEHALF OF
THE AMERICAN GAS ASSOCIATION
BEFORE THE
SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
ON THE
"NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986"
S. 2781
September 16, 1986

Introduction

Good morning, Chairman Nickles and members of the Subcommittee. I am Milt Honea, President and Chief Operating Officer of Arkansas Louisiana Gas Company headquartered in Little Rock, Arkansas. ARKLA is a utility, with service areas in Arkansas, Louisiana, Oklahoma, Kansas and Texas, and it is an interstate pipeline. I am here to present the views of the American Gas Association (A.G.A.), of which ARKLA is a member, on S. 2781, the "National Appliance Energy Conservation Act of 1986".

A.G.A. is a national trade association whose 300 natural gas distribution and transmission companies account for over 81% of the nation's annual utility sales. The natural gas industry serves over 166 million consumers in all 50 states.

I. A.G.A. Strongly Supports S. 2781 In Principle.

As you know, an impressive array of organizations is urging passage of S. 2781 for a number of valid reasons. While the member constituents of each of these groups are greatly varied, their expressed reasons for supporting this legislation are very similar. In fact, in reviewing the comments made by many of these groups at the August 14 press conference announcing this legislation, there are three recurring themes:

- S. 2781 will save enough electrical energy to prevent or forestall construction of new electric generating plants;
- S. 2781 will provide manufacturers with federal appliance efficiency standards to preempt a plethora of conflicting state standards, easing their burden of compliance considerably; and,
- S. 2781 will provide a uniform federal standard for appliance efficiency, offering consumers the dual benefits of more energy efficient appliances that may cost less than they would cost otherwise.

A.G.A. believes these goals are laudable and we sincerely believe S. 2781 will meet these goals much more effectively than under the current state-by-state regulatory _status quo_.

A.G.A.'s interest in appliance efficiency springs from our belief that efficient energy use is in the best interests of our customers. Our industry has been in the forefront of technological innovations that have resulted in the development and commercialization of high efficiency gas appliances, such as the latest generation of high efficiency gas furnaces. These developments have been market-driven and have not had state or federal legislative or regulatory mandates as their prime impetus. In fact, the marketplace reflects an increasing demand for high efficiency gas furnaces, and sales have increased dramatically to the point where, in 1985, these units comprised nearly one-third of the market.[1] We understand that a substantial number of these were sales to the secondary, or replacement, market. We continue to believe that the marketplace provides the best signals to spur energy efficient appliance designs.

Nevertheless, we are concerned that states may increasingly usurp the proper role of the marketplace in appliance efficiency, with the result being a myriad of state standards governing appliance efficiency. Consequently, the legislation's uniform national appliance efficiency standards would serve the manufacturers' need for consistency, while providing the operational advantage of phasing-in these standards over time, thereby promoting energy conservation. For this reason, A.G.A. endorses S. 2781 in principle and, with the following exception for certain small gas furnaces, we join with those

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1/ Gas Appliance Manufacturers Association, GAMA News, Percentage of High Efficiency Furnaces Grows, (Arlington, VA; March, 1986).

organizations that are calling for its enactment.

II. The Gas Furnace Standard Should Be Amended For Consistency With The Overall Goals of S. 2781.

As stated above, S. 2781 was widely heralded at the sponsors' August 14 press conference as being a means of preventing or postponing construction of new electric powerplants. As written, S. 2781 could achieve the opposite result. It will narrow the choices of heating equipment now available for consumers in homes, condominiums or apartments, particularly those that have minimal energy requirements (50,000 Btu/hour input or less), most likely driving builders of such homes to use electric resistance heating instead of gas furnaces. In effect, all central heating equipment included in S. 2781 (gas furnaces and electric heat pumps) will be shut out of the market by the least energy-efficient option: electric resistance baseboard heating and electric furnaces (neither of which is subject to a standard under the bill). This will hinder the legislation's goal of saving energy because, when one considers energy losses that occur from the point of extraction of the primary fuel through electric generation and transmission to the site, electric resistance heating is less than 33% efficient. By comparison, a mid-efficiency gas furnace is 71-80% efficient.[2]

[2]/ American Gas Association, Marketing Analysis: The Efficiency of Obtaining, Delivering and Utilizing Energy, (Arlington, VA: July 30, 1980) at 23.

The legislation achieves this unfortunate, and we believe unintended, result through provisions that would ban the conventional, atmospherically vented furnace by virtue of the manner defined in the test procedure and the prescribed AFUE level of no less than 78%. Since the AFUE for mid-efficiency furnaces runs from 71% to 80%, the bulk of conventional non-induced draft gas furnaces would also fall short of the legislation's gas furnace standard.

II. A. The Gas Furnace Standard Will Increase The First Cost Of Furnaces That Comply With The Standard.

The proposed gas furnace standard would hurt consumers in both the primary (or new construction) and the secondary (or replacement) markets. We believe that the bill would increase the first cost (i.e., the initial capital cost) of gas furnaces dramatically, perhaps by as much as $250 (see attached TABLE 1) thereby encouraging home builders, contractors or landlords in certain circumstances to opt for a less expensive first cost heating option. In most cases, we believe, electric resistance heating, for which the legislation sets no standard, would be this choice. The ultimate consumer, the homeowner or renter, would be done a disservice, since, as we stated above, electric resistance heating is less than half as efficient on a resource basis and significantly more expensive to operate as compared to a mid-efficiency gas furnace.[3]

One concern is that, since, unfortunately, the builder's purchase decision in most cases is made on first

[3] Id.

cost comparisons and not on payback considerations, this bill pre-ordains an inefficient and costly fuel choice. The consumer may pay less initially for the heating equipment if the builder opts for the less costly electric resistance heat and passes the lower price on to the consumer. However, the consumer would pay much higher fuel bills over the life of the equipment, thereby losing in the long run.

A.G.A. is proposing to amend S. 2781 to provide an AFUE standard of 71% for small gas furnaces of up to 50,000 Btu/hour input. Compared to the proposed standard of 78% AFUE for all gas furnaces, our proposal offers the consumer in small housing units an option that, in the long run, is much more advantageous. As the following table indicates,[4] this is because the 78% AFUE furnaces saves so little energy that the consumer would be forced to choose between equipment that could have a payback of up to 17 years (in the West-South-Central-States) or a less expensive heating option: electric resistance heating. With this kind of payback, the choice is obvious.

4/ The data in Tables 2 and 3 were derived from the American Gas Association's Gas Househeating Survey: 1985, (Arlington, VA; August, 1986).

TABLE 2

CONSUMER PAYBACK FOR DIFFERENT EFFICIENCY SMALL FURNACES

Example (West South Central Climate)*
50,000 Btu/hr Furnace

71% AFUE Furnace	78% AFUE Furnace
29 MMBtu consumed[1]	26 MMBtu consumed
$ 4.95/MMBtu (December 31, 1985 actual for SW region)	$ 4.95/MMBtu
$143.55 Fuel Bill	$128.70 Fuel Bill

- Capital cost differential between atmospheric 71% AFUE furnace and 78% AFUE induced draft furnace estimated $250.00 simple payback (zero cost of capital) is $250/$14.85 = 17 years. The actual payback would be longer given the increased maintenance associated with a higher efficiency unit.

Example (East North Central Climate)**
50,000 Btu/hr Furnace

71% AFUE Furnace	78% AFUE Furnace
53 MMBtu consumed[2]	48 MMBtu consumed
$ 5.33/MMBtu (December 31, 1985 actual for East North Central region)	$ 5.33/MMBtu
$282.49 Fuel Bill	$255.84 Fuel Bill

- Capital cost differential between atmospheric 71% AFUE furnace and 78% AFUE furnace estimated to be $250.00. Simple payback (zero cost of capital) is $250/26.65 = 9.4 years. The actual payback would be longer given the higher maintenance costs associated with the more expensive higher efficiency unit. [Note that with a 12% consumer loan interest rate, the fuel cost savings will not even cover the interest part of the financing charge].

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1. Assumes an 1000 square foot home, about 30% smaller than average home in region and size home expected to be heated by smaller furnace.

2. Assumes an 800 square foot home -- the maximum size that could be effectively heated with a 50,000 Btu/hr furnace (normal insulation level assumed).

* Arkansas, Louisiana, Oklahoma, Texas.
** Illinois, Indiana, Michigan, Ohio, Wisconsin.

We believe that, unless the gas furnace standard is amended, consumers will be driven to electric resistance heating, which will increase the demand for electricity. Thus, the legislation's goal of energy conservation through energy efficient appliances would be thwarted and the bill's goal of deferring or avoiding new powerplant construction would be subverted. It would be disingenuous to deny that one of our concerns is that gas utilities would lose a substantial end use market to the electric utility. Nevertheless, these results contradict what some have stated about S. 2781, i.e., that everyone will win if it is enacted as written. On the contrary, consumers will lose, and so will gas utilities.

II. B. The Replacement Market For Gas Furnaces Will Be Adversely Affected By The Gas Furnace Standard.

Another of our concerns pertains to the effect the bill's gas furnace standard will have on the secondary, or replacement, market. The customer will be faced with a narrower range of gas furnace options which, as the market exists today, are more expensive than conventional, atmospherically vented mid-efficiency furnaces. As we have stated above, the customer may choose a less costly heating option (an electric furnace) which would be less energy efficient and would be more expensive for the consumer to operate over the life of the product.

The impact of proscribing the least costly of small gas furnaces will be detrimental for low income consumers and for consumers purchasing small "starter homes". One of

A.G.A.'s member companies estimates that approximately 25% of its customers have annual family incomes of less than $15,000. By mandating an AFUE of 78% or greater, this legislation would force these families to pay approximately $250.00 plus installation costs over the cost of a base furnace for a gas furnace that meets the proposed standard. Rather than replace the furnace, they may defer this purchase and continue to use a worn out furnace that needs to be replaced. Alternatively, they may go without heat and rely on electric space heaters to provide necessary warmth, thereby using energy less efficiently and more expensively with less overall comfort. In any case, the goals of this legislation would be subverted.

III. A.G.A. Recommends Two Alternatives To Remedy Our Concerns With The Gas Furnace Standard.

III. A. Option A.

In view of our concerns about the effect of this legislation on gas furnaces, we believe that the gas furnace standard should be amended to read as follows:

> "325(f) STANDARDS FOR FURNACES. - (1) Furnaces. . . shall have an annual fuel utilization efficiency of not less than 78 percent, . . . and except for furnaces that have an input of up to 50,000 Btu/hour, in which case such furnaces shall have an annual fuel utilization efficiency of not less than 71 percent."

We believe this amendment is necessary if the legislation is to achieve its energy efficiency goals in reality as well as in principle. The 50,000 Btu/hour input cap would apply to smaller single family houses, townhouses and apartments, as well as homes in warmer climates which have lower energy needs. Moreover, this amendment will cover only a small percentage of units and, thus, will enhance the legislation's energy conservation goals without reducing overall energy savings. According to the latest data available to us compiled by the Gas Appliance Manufacturers Association, furnaces that meet this exception comprised 4% of the number of gas furnaces shipped during the first 9 months of 1983.[5] By limiting our proposal to these smaller furnaces, we recognize explicitly the appropriateness of the standard for larger units. However, in smaller houses or multifamily units, the standard as written simply will not be cost-effective.

A.G.A.'s proposed lower AFUE of 71% was selected to track the current California standard for gas furnaces. Moreover, it is consistent with the standards set in Section 325(e)(3) for gas direct heating equipment, which is categorized by size and type of heating equipment and which ranges in efficiency standards from 56% to 74% AFUE for similarly sized equipment.

III. B. Option B.

As an alternative to the above amendment, A.G.A. is willing to accept an amendment to the furnace standard that

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5/ Gas Appliance Manufacturers Association, Statistical Release: Gas Warm Air Furnaces by Efficiency Rating, January - September 1983 (Arlington, VA, 1983).

provides a blanket waiver from federal energy efficiency standards for any gas furnace that is up to 45,000 Btu/hour input. Although this amendment would cover smaller furnaces than under Option A discussed above, the fact that there would be no minimum AFUE specified federally would provide at least some low-cost gas heating equipment to consumers, builders and landlords in lieu of electric resistance heating. The payback figures are less impressive than under A.G.A.'s Option A, as can be seen from Table 3.

TABLE 3

CONSUMER PAYBACK FOR DIFFERENT EFFICIENCY SMALL FURNACES

Example (West South Central Climate)*
45,000 Btu/hr Furnace

65% AFUE Furnace	78% AFUE Furnace
32 MMBtu consumed[1]	26 MMBtu consumed
$ 4.95/MMBtu (December 31, 1985 actual for WSC region)	$ 4.95/MMBtu
$158.40 Fuel Bill	$128.70 Fuel Bill

- Capital cost differential between atmospheric 65% AFUE furnace and 78% AFUE induced draft furnace is estimated to be $250. Simple payback (zero cost of capital) is $250/$29.70 = 8.4 years. The actual payback would be longer given the higher maintenance costs associated with the more expensive, higher efficiency unit.

Example (East North Central Climate)**
45,000 Btu/hr Furnace

65% AFUE Furnace	78% AFUE Furnace
58 MMBtu consumed[2]	48 MMBtu consumed
$ 5.33/MMBtu (December 31, 1985 actual for ENC region)	$ 5.33/MMBtu
$309.14 Fuel Bill	$255.84 Fuel Bill

- Capital cost differential between atmospheric 65% AFUE furnace and 78% AFUE furnace estimated to be $250.

> Simple payback (zero cost of capital) is $250/53.30 = 4.7 years. The actual payback would be longer given the higher maintenance costs associated with the more expensive higher efficiency unit.**

Nevertheless, it would provide the consumer with a low-cost gas furnace option which S. 2781, as written, forecloses.

Finally, by adopting either of A.G.A.'s amendments you will satisfy the chief concern A.G.A. members have with this legislation. At a recent meeting of A.G.A. member company executives, a number of concerns surfaced in addition to the gas furnace standard and how it is affected by the lack of a standard for electric resistance heat. For example, the bill's proposed heat pump standard fails to address the heating side of the heat pump, focusing only on cooling cycle efficiencies. This can skew overall efficiency ratings, since it assumes that the heating cycle will be as efficient as the cooling cycle, which does not necessarily follow. We continue in our firm belief that the Department of Energy should address these omissions, as it would be empowered to do under Section 3 of the legislation. Nevertheless, in the interest of compromise and as a reflection of our overriding desire to see S. 2781 enacted, we urge you to adopt only our limited amendment to the gas furnace standard.

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*FOOTNOTES FOR TABLE 3.

1. Assumes an 1000 square foot home, about 30% smaller than average home in region and size home expected to be heated by smaller furnace.

2. Assumes an 800 square foot home -- the maximum size that could be effectively heated with a 45,000 Btu/hr furnace (normal insulation level assumed).

*Arkansas, Louisiana, Oklahoma, Texas.
**Illinois, Indiana, Michigan, Ohio, Wisconsin.

CONCLUSION

For the foregoing reasons, we support immediate enactment of S. 2781, with an amendment to the gas furnace standard that would make this legislation consistent with the stated goal of conserving energy through its efficient use. I would be glad to answer any questions you might have at this time.

COSTS FOR GAS FURNACE EFFICIENCY UPGRADES*

BASE CASE:	Good Quality, Conventional Atmospherically Vented Gas Furnace (Standing Pilot, 65% AFUE)	$435
1st	Eff. Upgrade - Electronic Ignition (No Standing Pilot, 71% AFUE)	$475 △ = $ 40
2nd	Eff. Upgrade - Electronic Ignition Plus Induced Draft (78 - 85% AFUE)	$655 △ = $220
3rd	Eff. Upgrade - Electronic Ignition Plus Power Burner/Forced or Inducer Draft Plus Secondary Heat Exchanger (85 - 90% AFUE)	$825 - 1055 △ = $ 390
4th	Eff. Upgrade - Fully Condensing (90 - 97% AFUE)	$ 1335 △ = $ 900

*(REF: Technical Support Document, Proposed Interim Energy Conservation Standards For New Federal Residential Bldgs - U.S. DOE).

Gas Househeating Survey: 1985

38th Annual Survey
Gas Utility Industry
United States

Househeating Customers, 1985
Unit Additions — Conversions and New Housing, 1986–1986
Househeating Market Shares by Utility Company, 1985
Competitive Fuel Prices, 1985

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Introduction

This report presents the results of the 38th Annual Gas Househeating Survey conducted by the American Gas Association. Data collected for 1985, as well as projected data for 1986, provide a comprehensive portrait of the residential gas market by state and region, including customers, fuel prices, anticipated inventory additions from new homes and conversions, and existing requirements on new customer hook-ups.

A total of 142 gas utility companies, serving 88% of the nation's residential gas customers, responded to this year's survey. Though the number of responding companies was lower than previous years due primarily to company mergers and consolidation, the representative percentage of gas customers was actually higher. The information provided by these utilities was expanded to obtain the state and national totals shown in Tables 3 and 5. Individual company data are listed by region and state in Appendices 1 and 2. Please note that some tabular data may not add to totals due to rounding.

The American Gas Association wishes to thank those companies who participated in the survey for making this publication possible.

I. Executive Summary

- Conversions of existing units from alternative fuels to gas househeating were 149,300 in 1985, a 9% increase over last year's level. Based on A.G.A. survey data, 113,475 or 76% of all heating conversions, were from fuel oil to gas. The remaining conversions to natural gas were 20,808 from electricity, 11,615 converting from LPG, and 3,381 from "other fuels" (coal, wood, etc.). The level of electric conversions has grown steadily in recent years. The share of conversions to gas from electricity, 14%, has doubled since 1983.

- New gas househeating unit additions numbered 607,200, a 5% increase. The addition of new gas househeating units from conversions of existing units and new housing combined totaled 756,500 in 1984, a 6% increase from last year.

- Utilities expect to add approximately 136,000 conversions in 1986, which would be down 9% from 1985. The projections for gas househeating additions from newly constructed units are about the same as 1985 at 597,600 units. This means that new housing would account for 82% of total anticipated househeating additions, while total househeating additions would decrease by 3%.

- In single family dwellings, gas consumption for househeating was 70.6 Mcf, while baseload consumption was 30.8 Mcf. By comparison the average multifamily dwelling unit consumed 44.1 and 23.2 Mcf for househeating and baseload use, respectively.

- Conservation, reported as the total percentage decline in consumption per customer corrected for weather variations, averaged 25.0% below the 1973 consumption level. Regionally, the conservation level ranged from a high of 32.1% in the Pacific division to a low of 20.5% in the East South Central division. This suggests a small increase in the conservation trend compared to last year.

- Average year-end prices declined in seven of nine census divisions during 1985 vs. 1984. The price declines ranged from $0.07/MMBtu to $0.46/MMBtu, or 1.3% to 8.3%. Average annual heating bills declined in eight divisions due to both the price moderation and lower degree days compared to last year. The heating bills declined an average of $43, with declines ranging from $18 to $96.

- There were 46.5 million residential gas customers by year-end 1985, a net increase of 1.3% over 1984. Househeating customer saturation increased by 0.5% to 88.8%.

- The U.S. housing construction market continued its vigorous growth in 1985. New housing completions increased by 3% to 1.7 million in 1985. Gas' overall market share of new housing completions increased to 39% in 1985 from 38% in 1984 based on a five percentage point increase in gas' market share in the multi family sector at the expense of electricity, which declined five percentage points in the multi family sector in 1985. The overall electric share dropped a point to 56%. Gas heated single family home completions actually increased, but showed a small decline in market share to 43% as electricity increased by one point to 49%. Gas' market share of total housing (both existing and new homes) was constant at 55%.

II. United States Housing Market In 1985

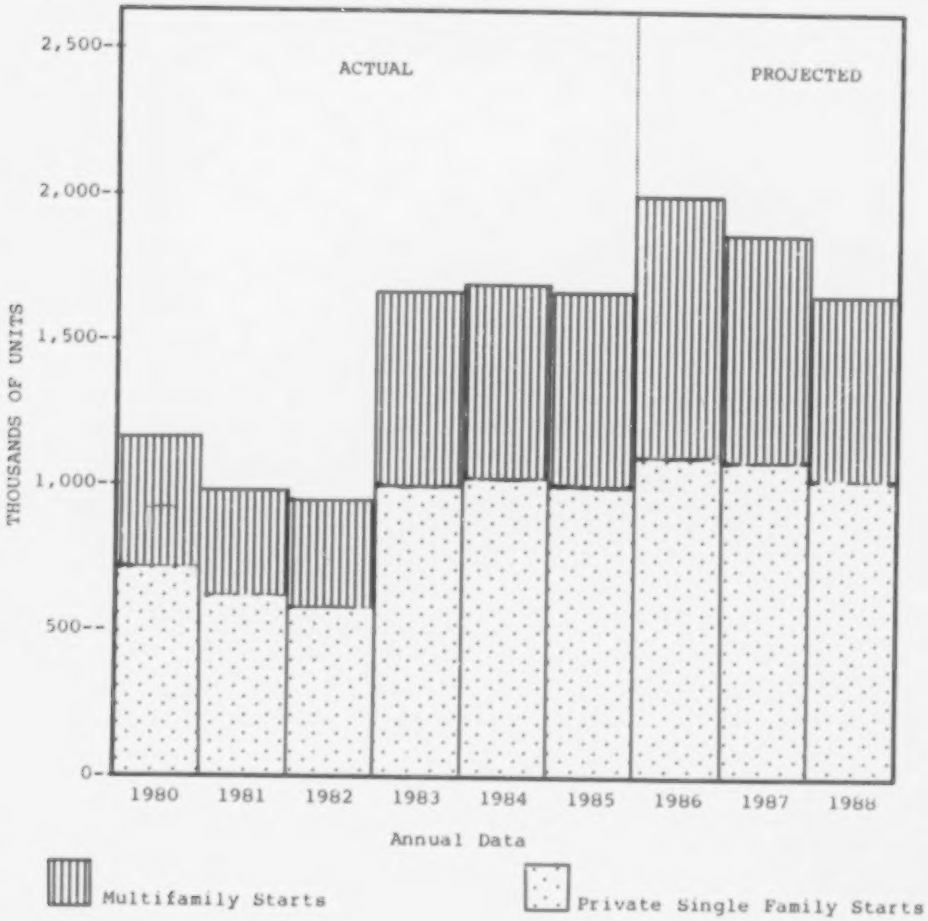
New Housing - Starts

The number of new private housing starts (seasonally adjusted) in 1985, 1.74 million units, was virtually the same as 1984 (see Figure 1). This level is slightly higher than the 1979 levels that existed just prior to the dramatic decline in housing starts in the 1980's that bottomed out at 1.06 million units in 1982. Construction of single family homes decreased slightly to 1.07 million, while the constiuction of multifamily units inceased slightly to around 610,000.

Recent monthly housing-start data indicate that the housing outlook for 1986 is very good. Privately owned housing starts in the first five months of 1986 were at a seasonally adjusted annual rate of nearly two million starts.[1] This is 14% above the average 1984 rate. Wharton Econometric Forecasting Associates (WEFA) has predicted that 1986 private housing starts would average 2.0 million units. WEFA expects the housing market to then decline over the following two years, with starts nearing 1.86 million in 1987 and 1.73 million in 1988.

Figure 1

PRIVATE HOUSING STARTS--ACTUAL AND PROJECTED
1980-1988



Source: Actual--U.S. Bureau of the Census, Construction Reports - Series C20, Housing Starts, May 1986.

Projected--Wharton Econometric Forecasting Associates Long Term Model, Baseline Forecast, Volume 4, Number 4, June, 1986.

New Housing - Completions

The housing industry recovery that began in 1983 is further evidenced by the increase in the number of unit completions (which lag housing starts by about 6 months) from 1.65 million in 1984 to 1.7 million in 1985, an increase of 3% (see Table 1). New gas completions increased from 626,000 new units in 1984 to 663,000 units in 1985, or 6% higher, according to the Census publication, Characteristics of New Housing: 1985. It is likely that most of this increase was from natural gas, since net LP gas units have gone down in recent years according to the Annual Housing Survey, another Census publication.

Approximately 1,072,000 of housing completions (63%) in 1985 were single family homes. Single family housing completions using gas heat about equaled the number of electrically heated completions within Standard Metropolitan Statistical Areas (SMSA's). There were 405,000 gas heated completions compared to 407,000 electric heated completions within SMSA's. However, outside of the SMSA's, in outlying suburban and rural areas, electric heated completions outnumbered gas with 121,000 completions compared to 61,000 for gas.

On the national level, the market share for natural gas heating increased one percentage point to 39% of all new 1985 completions. The electric share of all new completions in 1985 was 56%, down one percentage point. In the single family home category, the gas market share was 43%--down from 45% in 1984. The electric heating market share was 49% of single family homes, up from 48%. In contrast, the electric heating share for new multifamily units dropped to 67% from 72% in 1984. The gas share showed a corresponding increase of five percentage points to 26% of multifamily units.

Table I

1985 PRIVATE HOUSING COMPLETIONS-BY HEATING FUEL
(thousands of units)

Single Family	U.S. Share	U.S. Units	Northeast	Midwest	South	West
Gas[a]	43%	466	65	111	146	144
Electricity	49	528	63	31	354	79
Oil	3	36	32	(I)	(I)	(I)
Other	4	42	8	7	11	16
Subtotal	100%	1,072	168	151	514	239
Multifamily						
Gas[a]	31%	197	25	36	34	101
Electricity	67	425	17	42	263	103
Oil	1	3	3	(I)	(I)	(I)
Other	1	6	1	1	1	3
Subtotal	100%	631	46	79	298	207
Total		1,703	214	230	812	446

[a] Includes liquefied petroleum gas.
(I) Insufficient sample size to allow publication.

Note: Totals may not add due to rounding

Source: U.S. Bureau of the Census, Characteristics of New Housing: 1985, Construction Reports C25-85-13, June 1986.

Gas heated completions in 1985 outnumbered electric heated completions in three of four regions among single family homes. However, new electric heated completions among single family homes in the South outnumbered gas heated completions by 208,000, or more than double. In the multifamily sector gas completions outnumbered electric in the Northeast region. Again, the South showed a wide margin (229,000) in electric heated completions compared to gas, although fewer than last year. Gas multifamily completions increased by 56% in the Northeast and by 44% in the West.

Existing Housing

The Bureau of the Census has switched to a biennial basis for the Annual Housing Survey and the data for 1985 are not yet available. A.G.A. estimated 85.9 million occupied housing units in the United States in 1985. Of this total, 47.2 million, or 55%, were units which used natural gas for heating (see Table 2). A regional breakdown of the 47.2 million gas heated units found 17% in the Northeast, 33% in the Midwest (sometimes called North Central), 26% in the South, and 24% in the West.

As a percentage of total homes, electrically heated units stayed at 19% in 1984 with a total of 16.6 million units. This is an average annual increase of 3.2% since 1980. The number of units heated with fuel oil continued to decline, falling to 12.9 million in 1984, or 15% of the total. The number of homes heated by other fuels (wood, coal, solar, etc.) retained its 11% market share, totaling about 9.2 million units in 1984. The addition of 2.1 million units in this category between 1981 and 1983 was entirely due to a doubling in wood heated homes in each region during this time period.

In all regions, except the Northeast, gas had the largest market share of heated homes. Gas heated housing is most prevalent in the Midwest states, maintaining a 73% share of the market. In the Northeast region, where oil heated homes have the largest market share, gas maintained its increased market share at 43% in 1984, up from 37% in 1978 and 41% in 1981.

III. Residential Gas Customers in 1985

Total Residential Customers

With net year-end customer additions of 617,900, the total number of gas customers^2 reached 46.5 million in 1985, a 1.3% increase over 1984 (see Table 3). The West, with 228,800 new customers, accounted for 37% of all new residential customer additions. The North Central region accounted for 29% of the new customer additions with 179,400. The South and Northeast regions accounted for 19% and 15% of additions, respectively. Overall, this indicates greater regional balance this year.

Table 2

U.S. RESIDENTIAL HOUSING INVENTORY BY HEATING FUEL 1981-1985

(Thousands of Occupied Units[a])

	1981	1983	1985 Estimate[b]	
				Market Share
United States	83,175	84,638	87,400	
Gas	46,084	46,699	47,800	55%
Electric	15,486	15,683	17,600	20
Oil[c]	14,494	13,031	12,800	15
Other[d]	7,111	9,224	9,200	10
Northeast	17,852	18,221	18,400	
Gas	7,335	7,741	7,900	43%
Electric	1,281	1,319	1,500	8
Oil[c]	8,642	8,226	8,100	44
Other[d]	594	934	900	5
Midwest	21,564	21,618	21,900	
Gas	15,308	15,656	15,900	73%
Electric	2,210	2,172	2,300	10
Oil[c]	2,328	1,774	1,700	8
Other	1,718	2,015	2,000	9
South	27,430	27,931	29,500	
Gas	12,725	12,346	12,700	43%
Electric	8,225	8,557	9,800	33
Oil[c]	2,905	2,559	2,500	9
Other[d]	3,575	4,470	4,500	15
West	16,329	16,868	17,600	
Gas	10,716	10,956	11,300	64%
Electric	3,770	3,635	4,000	23
Oil[c]	619	472	500	3
Other[d]	1,224	1,805	1,800	10

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[a] Units include both single and multifamily.

[b] The Annual Housing Survey is now conducted biannually. The 1985 survey results will not be available until 1987. A.G.A. estimates for 1985 were derived by adding number of dwellings completed by fuel type, as reported by U.S. Bureau of Census, Construction Reports - Series C-25, for 1984 and 1985, to 1983 actual data, considering also the net gains and losses as a result of fuel switching and demolitions in those two years.

[c] Oil includes kerosene.

[d] Other includes LP gas, coal, wood, other, and none.

Source: U.S. Bureau of the Census, Annual Housing Survey: General Housing Characteristics, 1981 and 1983.

Table 3

RESIDENTIAL AND HOUSEHEATING CUSTOMERS OF GAS UTILITIES, AND 1985 HOUSEHEATING UNIT ADDITIONS, BY STATE, AS OF DECEMBER 31, 1985

(Thousands)

	Residential Customers			1985 Househeating Unit Additions From New Housing and Conversions				
Region, Division and State	Total	House Heating	Percent Heating	Total (100%)	New Housing Number	(%)	Conversions Number	(%)
United States	46498.2	41289.8	88.8	756.5	607.2	80	149.3	20
NORTHEAST	9520.4	6216.2	65.3	153.1	83.7	55	69.5	45
New England	1698.4	1148.0	67.6	40.7	18.7	46	22.0	54
Connecticut	399.2	257.5	64.5	11.1	5.5	50	5.6	50
Maine	12.2	9.2	75.4					
Massachusetts	1046.8	701.1	67.0	21.9	7.1	32	14.8	68
New Hampshire	52.8	42.5	80.5	3.0	2.8	96	.1	4
Rhode Island	170.8	123.3	72.2	3.4	2.8	81	.6	19
Vermont	16.6	14.4	86.7	1.3	.5	37	.8	63
Middle Atlantic	7822.0	5068.2	64.8	112.4	64.9	58	47.5	42
New Jersey	1801.8	1183.9	65.7	60.4	39.2	65	21.2	35
New York	3780.3	1967.0	52.0	28.1	12.6	45	15.5	55
Pennsylvania	2239.9	1917.2	85.6	24.0	13.2	55	10.8	45
NORTH CENTRAL	14376.7	13605.0	94.6	180.8	142.4	79	38.4	21
East North Central	10379.0	9795.0	94.4	122.7	91.5	75	31.2	25
Illinois	3107.4	2780.3	89.5	38.4	30.7	80	7.8	20
Indiana	1222.8	1183.3	96.8	11.8	6.2	53	5.6	48
Michigan	2398.5	2328.0	97.1	33.5	28.8	86	4.6	14
Ohio	2625.5	2573.5	98.0	22.5	18.7	83	3.8	17
Wisconsin	1024.7	930.0	90.8	16.5	7.1	43	9.3	57
West North Central	3997.7	3810.0	95.3	58.0	50.9	88	7.2	12
Iowa	693.7	670.1	96.6	4.5	3.4	76	1.1	24
Kansas	710.7	657.1	92.5	7.2	6.8	94	.4	6
Minnesota	839.9	799.0	95.1	26.4	21.9	83	4.5	17
Missouri	1161.9	1106.2	95.2	13.8	13.5	97	.4	3
Nebraska	408.3	400.9	98.2	4.1	3.8	93	.3	7
North Dakota	83.8	79.5	94.9	.8	.2	32	.5	68
South Dakota	99.4	97.1	97.7	1.2	1.2	97	.0	3
SOUTH	11548.0	10737.6	93.0	145.6	115.8	80	29.8	20
South Atlantic	4068.0	3664.0	90.1	83.7	62.5	75	21.3	25
Delaware	79.8	55.6	69.7	1.5	.1	7	1.4	93
District of Columbia	132.2	99.4	75.2	3.4	.2	6	3.2	94
Florida	420.8	370.2	88.0	2.1	.6	27	1.5	73
Georgia	1110.6	1073.6	96.7	44.6	44.6	100	a	a
Maryland	744.8	594.6	79.8	10.1	4.3	43	5.7	57
North Carolina	406.7	393.5	96.8	10.4	4.9	47	5.5	53
South Carolina	290.6	264.2	90.9	a	a	a	a	a
Virginia	524.7	461.1	87.9	11.4	7.5	66	3.9	34
West Virginia	357.9	351.8	98.3	.3	.3	94	.0	6
East South Central	2119.2	2068.4	97.6	24.2	18.6	77	5.5	23
Alabama	669.4	656.9	98.1	8.3	7.0	84	1.3	16
Kentucky	589.4	566.3	96.1	5.4	4.4	80	1.1	20
Mississippi	373.5	369.2	98.8	.6	.4	74	.2	26
Tennessee	486.9	476.0	97.8	9.9	6.9	70	3.0	30
West South Central	5360.8	5005.1	93.4	37.7	34.7	92	3.0	8
Arkansas	477.5	385.6	80.8	2.1	2.1	100	a	a
Louisiana	924.1	890.5	96.4	2.4	2.1	87	.3	13
Oklahoma	820.2	787.9	96.1	7.9	7.5	95	.4	5
Texas	3139.0	2941.1	93.7	25.4	23.0	91	2.3	9
WEST	11053.1	10731.0	97.1	277.1	265.3	96	11.7	4
Mountain	2784.9	2679.1	96.2	59.7	57.4	96	2.3	4
Arizona	546.3	472.4	86.5	7.1	6.9	97	.2	3
Colorado	916.6	916.4	100.0	30.3	30.3	100	a	a
Idaho	105.5	104.2	98.8	3.0	1.3	44	1.7	56
Montana	169.7	169.1	99.6	.8	.8	92	.1	8
Nevada	204.6	179.6	87.8	7.1	6.8	95	.4	5
New Mexico	337.9	337.9	100.0	11.0	11.0	100	a	a
Utah	392.9	388.7	98.9	a	a	a	a	a
Wyoming	111.4	110.8	99.5	.4	.4	98	.0	2
Pacific	8268.2	8052.0	97.4	217.4	208.0	96	9.4	4
Alaska	64.2	64.2	100.0	a	a	a	a	a
California	7526.8	7366.6	97.9	197.8	197.7	100	.1	0
Hawaii	29.3	.0	0.0	a	a	a	a	a
Oregon	283.1	262.1	92.6	5.8	3.6	62	2.2	38
Washington	364.9	359.0	98.4	13.7	6.6	48	7.1	52

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[a] Insufficient Data

Regional totals may not add due to rounding.

Househeating Customers

About 41.3 million, or 88.8% of all 1985 residential gas customers were househeating customers. The gas househeating/total residential gas customer ratio, i.e., market saturation, increased by one half percentage point from 1984. Househeating customer net additions totaled 799,400 in 1985, a substantial increase in net additions compared to last year due, in part, to revisions in prior year data. This included existing gas baseload customers who converted their non-gas heating system to gas, as well as customers added through new construction and conversions from alternative fuels.

Gas Househeating Unit Additions

The gas industry added 756,500 househeating units in 1985 (see Table 3), a 6% increase from 1984. Of total additions, 607,200 were from new housing[3], an increase in new units of 5% from 1984. It represents about the same share of househeating additions from new housing (80%) as in 1984. The West and South showed the highest ratio of additions from new housing versus conversions, 96% and 80% respectively, whereas, the Northeast showed only 55% from new housing.

In 1985, 149,300 housing units were converted from an alternative fuel to natural gas (see Table 4), an increase of 9% over last year's level of conversions. The actual number of 1985 conversions exceeded the forecast of 122,400 made by responding companies in 1984. This consistent level of conversions is believed to be a result of stable prices for heating oil (the main source of conversions) and uncertainty over the effects of gas pricing legislation.

The respondents were asked to provide a breakdown of the converted units by fuel type. The utilities providing data in this category represented 78% of total 1985 conversions. Based on these data, 113,475 units, or 76%, were conversions from fuel oil to gas. The share of fuel oil conversions dropped from 83% in 1983 and 77% in 1984. Propane and electricity accounted for 8% and 14% each with 11,615 and 20,808 units, respectively, while other (coal, wood, etc.) accounted for 3,381 (2%). Figure 2 shows how both the level of conversions from electricity and the share of electric conversions among all conversions to gas have grown since 1981--in fact, doubling since 1983.

Approximately 82%, or 121,900 conversions, were in four of the nine census divisions of the country -- the Middle Atlantic, East North Central, South Atlantic and New England divisions. These same four divisions accounted for 91% of all conversions from fuel oil. Total fuel oil conversions increased by 7% compared to last year. Conversions from electricity showed a 12% increase compared to last year. The electricity conversions were greatest in the East North Central and West North Central divisions. Propane conversions increased 25% over last year.

As part of the survey, respondents were asked to project additions to the househeating inventory from both new construction and conversions for 1986 (see Table 5). The results indicate that utilities expect to add approximately 136,000 conversions, or slightly below the 1985 level.

Figure 2

Househeating Conversions from Electricity to Gas

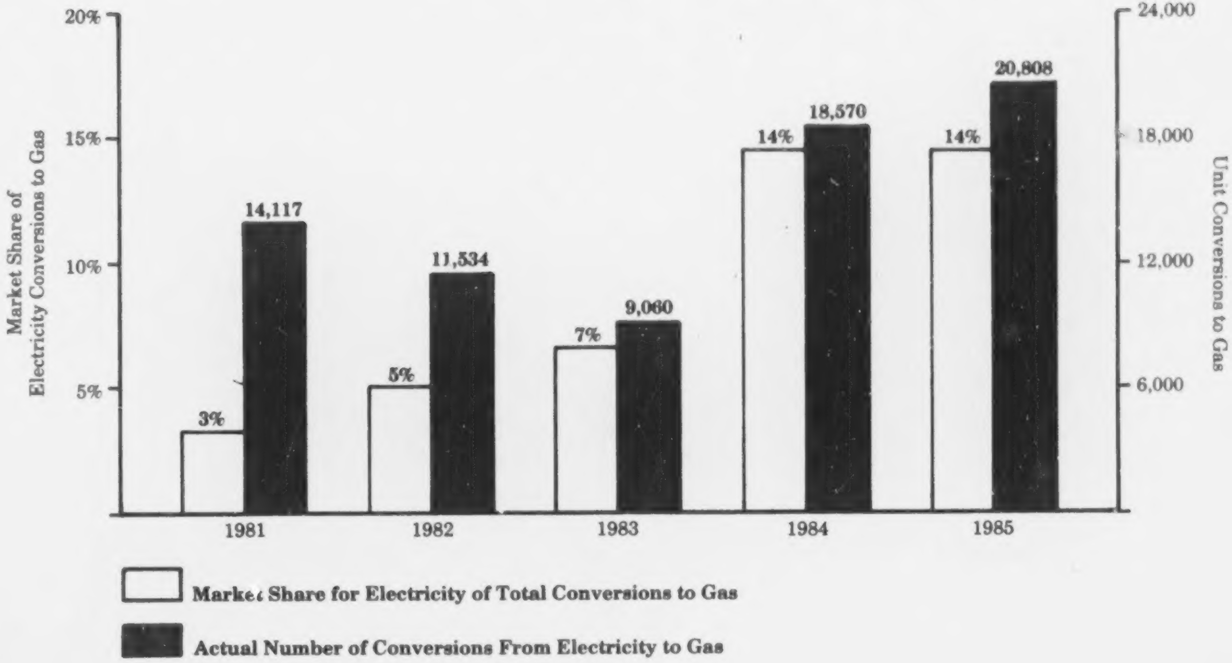

Table 4

HOUSEHEATING CONVERSIONS TO NATURAL GAS IN 1984 BY TYPE OF FUEL

Region	Oil		Propane		Electricity		Other[a]		Total	
	Units	%	Units	%	Units	%	Units	%	Units	%
United States	113,475	76	11,615	8	20,808	14	3,381	2	149,279	100
New England	20,520	93	390	2	1,024	5	66	b	22,000	15
Middle Atlantic	42,756	90	341	1	2,305	5	2,098	4	47,500	32
East Nortn Central	21,873	70	4,362	14	4,277	14	688	2	31,200	21
West North Central	2,705	38	2,412	33	2,076	29	7	b	7,200	5
South Atlantic	19,527	92	208	1	1,349	6	95	1	21,179	14
East South Central	88	2	1,163	21	4,021	73	228	1	5,500	4
West South Central	0	0	1,547	52	1,453	48	0	0	3,000	2
Mountain	299	13	927	40	1,066	46	8	1	2,300	2
Pacific	5,707	61	265	3	3,237	34	191	2	9,400	5

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[a] "Other" includes conversions from coal, wood, etc.

[b] Less than 1%.

Table 5
1986 ANTICIPATED ADDITIONS
OF GAS HOUSEHEATING UNITS

(Thousands)

Region, Division, and State	Total (100%)	New Housing		Conversions	
		Number	(%)	Number	(%)
United States	733.2	597.6	82	135.6	18
NORTHEAST	138.6	78.2	56	60.3	44
New England	39.4	21.1	53	18.3	47
Connecticut	10.9	6.0	55	4.9	45
Maine					
Massachusetts	19.4	7.5	39	11.9	61
New Hampshire	4.2	4.1	96	.2	4
Rhode Island	3.5	2.9	84	.6	16
Vermont	1.3	.5	39	.8	61
Middle Atlantic	99.2	57.2	58	42.0	42
New Jersey	52.0	33.8	65	18.2	35
New York	28.5	13.1	46	15.5	54
Pennsylvania	18.7	10.3	55	8.4	45
NORTH CENTRAL	181.6	143.3	79	38.3	21
East North Central	125.2	94.4	75	30.9	25
Illinois	40.8	32.7	80	8.2	20
Indiana	15.6	9.0	58	6.6	42
Michigan	32.1	28.4	89	3.7	11
Ohio	22.1	17.8	81	4.3	19
Wisconsin	14.6	6.5	44	8.1	56
West North Central	56.3	48.9	87	7.4	13
Iowa	4.1	3.1	75	1.0	25
Kansas	7.6	7.2	95	.4	5
Minnesota	25.0	20.2	81	4.8	19
Missouri	13.9	13.5	97	.4	3
Nebraska	3.5	3.4	97	.1	3
North Dakota	1.0	.4	40	.6	60
South Dakota	1.2	1.1	94	.1	6
SOUTH	134.4	109.3	81	25.2	19
South Atlantic	71.1	55.2	78	15.9	22
Delaware	.9	.3	39	.5	61
District of Columbia	2.4	.4	17	2.0	83
Florida	2.1	.7	34	1.4	66
Georgia	41.7	41.7	100		
Maryland	9.2	5.3	58	3.9	42
North Carolina	9.5	4.4	46	5.1	54
South Carolina	[a]	[a]	[a]	[a]	[a]
Virginia	5.1	2.1	42	3.0	58
West Virginia	.3	.2	83	.0	17
East South Central	25.0	19.4	78	5.6	22
Alabama	8.9	7.7	87	1.2	13
Kentucky	4.1	2.4	60	1.7	40
Mississippi	.8	.5	62	.3	38
Tennessee	11.2	8.9	79	2.4	21
West South Central	38.3	34.7	90	3.7	10
Arkansas	.4	.4	100		
Louisiana	1.9	1.4	72	.5	28
Oklahoma	7.5	7.1	94	.5	6
Texas	28.5	25.8	91	2.7	9
WEST	278.6	266.8	96	11.8	4
Mountain	41.2	39.1	95	2.1	5
Arizona	5.4	5.4	99	.0	1
Colorado	24.1	24.1	100		
Idaho	2.7	1.2	43	1.5	57
Montana	.6	.5	82	.1	18
Nevada	8.0	7.6	95	.4	5
New Mexico	[a]	[a]	[a]	[a]	[a]
Utah	[a]	[a]	[a]	[a]	[a]
Wyoming	.3	.3	100	0.0	0
Pacific	237.4	227.7	96	9.7	4
Alaska	[a]	[a]	[a]	[a]	[a]
California	217.5	217.3	100	.2	0
Hawaii	[a]	[a]	[a]	[a]	[a]
Oregon	5.8	3.6	62	2.2	38
Washington	14.1	6.8	48	7.3	52

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[a] Insufficient Data
Regional totals may not add due to rounding.

The projections for gas househeating additions from newly constructed units are a little above 1985 at 597,400 units. This means that total househeating additions would increase by 2.7%.

Heating Appliance Data

There was a 2% increase in manufacturers' shipments of residential heating equipment (see Table 6), which is consistent with the increase in 1985 in housing completions and starts. Shipments of gas warm air furnaces decreased in 1985 by 1%, while gas boiler shipments increased by 7%. Gas wall furnace shipments rose 15% and floor furnace shipments increased 6%.

Electric warm air furnace shipments increased by 3% in 1985, while heat pump shipments increased 5%. Shipments of oil warm air furnaces decreased 1% in 1985, while oil boiler shipments increased 14%.

Gas Consumption Per Unit

Respondents to the survey were asked to estimate the average annual gas consumption for both single and multifamily dwellings. Utilities representing 87% of all gas househeating customers responded to this portion in the survey. These responses were then used to develop the U.S. and regional average estimates of per unit gas use. Both categories were weighted by the number of residential gas customers for each responding utility in each state. In addition, the multifamily data represented a weighted average of dwellings with 2-4 units, and dwellings with 5 or more units (see Table 7).

Due to changes in the reporting methods of some utilities, particularly in the definition of baseload and multifamily gas use and consumption per unit, consumption data from year to year are not always comparable. With this caveat in mind, a review of 1985 combined average consumption data (U.S. average weighted by customer and dwelling type) indicated that total per unit gas consumption was 91.6 Mcf for all units, while househeating was 63.0 Mcf and baseload consumption was 28.6 Mcf. In single family dwellings, gas consumption for househeating was 70.6 Mcf, while baseload consumption was 30.8 Mcf. By comparison the average multifamily dwelling unit consumed 44.1 and 23.2 Mcf, respectively, for househeating and baseload use.

Climatic conditions have the most significant impact on gas use for househeating purposes, but the size and thermal integrity of the structure must also be considered. Reflecting these factors, single family unit consumption was highest for househeating in the North Central region at 98.3 Mcf, and lowest in the West region at 46.1 Mcf. Gas consumption for househeating in multifamily dwellings followed a similar pattern with per unit consumption in the North Central region at 66.4 Mcf, with a low of 24.2 Mcf in the West region. Table 7 includes weather data for each region in the form of annual heating degree days for calendar year 1985 and the 30-year normal heating degree days. The degree day data are weighted by gas househeating customers.

Table 6

MANUFACTURERS' SHIPMENTS OF
RESIDENTIAL HEATING EQUIPMENT, 1981-1985

Category	1981	1982	1983	1984	1985	Percentage Change from 1983
Central Heating Equipment						
Warm Air Furnaces						
Gas	1,416,700	1,155,600	1,661,765	1,849,200	1,822,295	- 18
Oil[a]	81,200	103,500	127,305	148,025	147,260	- 1
Electricity	234,500	177,100	339,950	354,435	366,020	+ 3
Boilers						
Gas	161,600	147,600	147,710	179,870	192,455	+ 7
Oil[a]	67,492	72,822	82,622	90,586	103,527	+14
Electric Heat Pumps	414,129	316,339	536,819	632,157	665.184	+ 5
Other Gas Heating Equipment						
Wall Furnaces	127,160	132,640	168,310	179,310	206,430	+15
Floor Furnaces	10,552	18,811	18,775	20,825	22,085	+ 6
Total Residential Heating Equipment	2,513,333	2,124,412	3,083,256	3,454,408	3,525,256	+ 2

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[a] Data not expanded.

Source: Gas Appliance Manufacturers Association, Statistical Highlights, July 10, 1986. Heat pump data obtained from the Air Conditioning and Refrigeration Institute.

Table 7

1985 AVERAGE ANNUAL GAS CONSUMPTION/UNIT[a] BY REGION (Mcf)

Region	Single Family	Multi-Family[b]	Combined Average[c]	Heating Degree Days[d] 1985	Heating Degree Days[d] 30-year Normal
Northeast					
Heating	97.4	60.0	81.4	5,274	5,676
Baseload	38.5	30.4	34.9		
Total	135.9	90.4	116.3		
Midwest					
Heating	98.3	66.4	89.9	6,141	6,190
Baseload	35.0	25.3	32.4		
Total	133.3	91.7	122.3		
South					
Heating	54.1	40.5	51.1	2,868	3,026
Baseload	29.7	25.6	38.8		
Total	83.8	66.1	79.9		
West					
Heating	46.1	24.2	39.5	2,500	2,400
Baseload	30.1	21.6	27.5		
Total	76.2	45.8	67.0		
U.S. Average					
Heating	70.6	44.1	63.0	3,928	4,378
Baseload	30.8	23.2	28.6		
Total	101.4	67.3	91.6		

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[a] Results for 1985 are based on responses from 160 different markets.

[b] Weighted average of dwellings containing 2-4 units and dwellings containing 5 units or more.

[c] Weighted by customer and dwelling type.

[d] Calendar year heating degree days as reported are then weighted by gas househeating customers (see Appendix 1 for detailed definitions). The 30-year normal are also weighted by gas househeating customers as opposed to total population.

Gas consumption for baseload use, which may include water heating, cooking, clothes drying and air conditioning, will vary with the size and type of appliance in the unit. Baseload consumption also has some seasonality reflecting lifestyle preferences under the various climatic conditions. For single family dwellings, baseload consumption was lowest in the West region at 30.1 Mcf, and highest in the Northeast region at 38.5 Mcf. Baseload consumption for multifamily dwellings ranged from 21.6 Mcf in the West to 30.4 Mcf in the Northeast.

Conservation

Companies representing 69% of the gas househeating customers indicated that in 1985 conservation, measured as the total percentage decline in consumption per househeating customer not explained by the weather, has reduced consumption to an average of 25.0% below the pre-1973 level (down from 23.9% in 1984). Conservation percentages reported by each company were weighted by househeating customer data from each company to derive regional and national conservation estimates. The magnitude of conservation ranged from a high of 32.1% below the pre-1973 level of consumption in the Pacific region to a low of 20.5% in the New England division (see Table 8).

Again this year the survey included a question on baseload conservation. Almost 100 companies, primarily in the Midwest and Northeast regions, indicated that baseload consumption per customer had moderated since 1973 -- mostly through the introduction of more efficient appliances, lower water heater settings, water heater insulation, and pilotless ignitions. However, fewer than thirty companies responded with quantitative data describing baseload conservation (as the change in third quarter consumption per customer between a given period of time, i.e., 1973 and 1984). All of the companies that responded to this question also indicated that their baseload consumption did not measurably vary with heating degree days. This response probably reflects the difficulty in developing reliable data on baseload consumption as much as it does the fact that baseload consumption is a smaller and less variable component of overall average gas consumption per home.

Table 8

1985 AVERAGE CONSERVATION BY REGION
(Percent Decline from 1973 Baseline)

Region	Conservation[a] (%)
Northeast	21.7
New England	20.5
Middle Atlantic	23.3
North Central	26.4
East North Central	26.8
West North Central	25.9
South	23.5
South Atlantic	23.5
East South Central	20.9
West South Central	26.5
West	31.7
Mountain	31.3
Pacific	32.1
United States	25.0

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[a] The total percent decline in consumption normalized for weather from the pre-embargo 1973 baseline. Results for 1985 are based on individual company responses from 111 different markets and are weighted by househeating customers.

FOOTNOTES

1. Source: U.S. Department of Commerce, Bureau of the Census, Construction Reports--Housing Starts, Series C-20, June 1986.

2. At most utilities a residential customer is defined as an individual or organization purchasing gas for domestic purposes (heating, cooking) at one location under one rate classification, i.e., a meter represents a single customer.

3. Because of inconsistencies in the definition of a completed housing unit (used by the Bureau of the Census) and an on-line gas customer (used by a gas utility), the number of gas heated housing units added from new construction reported in the survey does not match the Census figures shown in Table 1.

APPENDIX 1

HOUSEHEATING DATA
1985 ACTUAL AND 1986 ANTICIPATED
BY COMPANY

This Appendix presents gas househeating data obtained from a survey of 142 companies on a regional, state and company-by-company basis. Column 1 of the Appendix shows reported residential and househeating customers. Residential and househeating customer data in the 1985 survey have been reconciled with the A.G.A. Uniform Statistical Reports, which form the basis of the A.G.A. *Gas Facts* publication. A gas customer is equal to a meter for billing *purposes,* while a househeating unit refers to the number of actual residences which use gas for space heating. Column 2 provides average baseload and heating consumption per customer, and the number of heating degree days (A heating degree day is a measure of the coldness of the weather, based on the extent to which the daily mean temperature falls below a reference temperature, usually 65°F). Column 3 shows the gas heating market share, defined as the percentage of total dwelling units in the franchise areas that are served by gas for househeating.

The market share should not be confused with househeating saturation, which is the number of gas househeating customers as a percentage of the total number of gas customers on a given system. It should also be noted that reported market share figures, in particular, may be inconsistent in some cases due to different interpretations for an individual utility from year to year. This question was revised in 1981 so that data reported in subsequent years may remain consistent. Column 4 summarizes reported househeating unit additions for 1985 and *anticipated* for 1986, disaggregated into additions from new construction, conversions, losses and net additions. In some cases, a change in methodology may result in inconsistent annual data for an individual utility.

DIVISION STATE COMPANY	CUSTOMERS	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR)		GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS				
	YEAR-END	HEAT-ING	BASE-LOAD		YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
NEW ENGLAND									
CONNECTICUT									
SOUTHERN CONNECTICUT GAS CO.					1985	1,666	2,001	5	3,602
ALL RESIDENTIAL	129,268		30.0	40	1986	1,665	2,035	NA	NA
HOUSEHEATING ONLY	69,110	54.0							
HEATING DEGREE DAYS		5,389							
CONNECTICUT NATURAL GAS					1985	1,399	1,479	120	2,758
ALL RESIDENTIAL	119,328		35.0	42	1986	1,400	1,000	120	2,260
HOUSEHEATING ONLY	65,608	82.0							
HEATING DEGREE DAYS		6,230							
NORTHEAST UTILITIES					1985	2,298	1,960	130	4,128
ALL RESIDENTIAL	144,062		35.0	16	1986	2,500	1,700	130	4,370
HOUSEHEATING ONLY	95,186	105.0							
HEATING DEGREE DAYS		5,940							
NEW ENGLAND									
MASSACHUSETTS									
BOSTON GAS CO.					1985	364	6,464	NA	NA
ALL RESIDENTIAL	450,958		36.0	36	1986	500	7,000	NA	NA
HOUSEHEATING ONLY	233,437	106.0							
HEATING DEGREE DAYS		5,646							
COLONIAL GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	37,494		35.0	40	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	33,035	85.0							
HEATING DEGREE DAYS		5,257							
COMMONWEALTH GAS CO.					1985	1,596	1,969	NA	NA
ALL RESIDENTIAL	191,873		30.0	39	1986	1,340	1,650	NA	NA
HOUSEHEATING ONLY	156,196	120.0							
HEATING DEGREE DAYS		6,688							
FALL RIVER GAS CO.					1985	180	551	10	721
ALL RESIDENTIAL	37,521		30.0	78	1986	195	565	10	750
HOUSEHEATING ONLY	31,707	75.0							
HEATING DEGREE DAYS		5,928							
BAY STATE GAS CO.					1985	1,300	4,274	50	5,524
ALL RESIDENTIAL	189,802		36.0	36	1986	1,500	1,210	50	2,660
HOUSEHEATING ONLY	133,665	89.0							
HEATING DEGREE DAYS		6,669							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
NEW ENGLAND									
MASSACHUSETTS									
ESSEX COUNTY GAS CO.									
ALL RESIDENTIAL	28,891		25.0	50	1985	700	350	150	900
HOUSEHEATING ONLY	21,502	80.0			1986	1,000	500	125	1,375
HEATING DEGREE DAYS		5,373							
LOWELL GAS CO.									
ALL RESIDENTIAL	45,516		40.0	55	1985	1,996	221	130	2,087
HOUSEHEATING ONLY	44,257	96.0			1986	2,500	176	100	2,576
HEATING DEGREE DAYS		5,798							
NEW ENGLAND									
NEW HAMPSHIRE									
GAS SERVICE, INC.									
ALL RESIDENTIAL	22,046		35.0	55	1985	1,600	42	0	1,642
HOUSEHEATING ONLY	18,965	80.0			1986	2,000	65	0	2,065
HEATING DEGREE DAYS		6,900							
MANCHESTER GAS CO.									
ALL RESIDENTIAL	15,484		35.0	42	1985	360	36	16	380
HOUSEHEATING ONLY	10,353	90.0			1986	800	61	12	849
HEATING DEGREE DAYS		6,900							
NEW ENGLAND									
RHODE ISLAND									
VALLEY GAS CO.									
ALL RESIDENTIAL	44,913		40.0	45	1985	246	618	185	679
HOUSEHEATING ONLY	32,951	105.0			1986	220	546	105	660
HEATING DEGREE DAYS		6,357							
THE PROVIDENCE GAS CO.									
ALL RESIDENTIAL	120,816		NA	35	1985	2,430	NA	NA	NA
HOUSEHEATING ONLY	86,592	NA			1986	2,600	NA	NA	NA
HEATING DEGREE DAYS		5,659							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	YEAR	GAS-HTD HOUSING UNIT ADDITIONS NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
NEW ENGLAND									
VERMONT									
VERMONT GAS SYSTEMS					1985	380	653	NA	NA
ALL RESIDENTIAL	13,254		35.7	NA	1986	400	630	NA	NA
HOUSEHEATING ONLY	11,429	95.3							
HEATING DEGREE DAYS		7,703							
MIDDLE ATLANTIC									
NEW JERSEY									
SOUTH JERSEY GAS CO.					1985	7,395	1,673	1,579	7,489
ALL RESIDENTIAL	158,574		32.3	35	1986	7,092	2,120	1,591	7,621
HOUSEHEATING ONLY	126,111	64.1							
HEATING DEGREE DAYS		4,156							
NEW JERSEY NATURAL GAS CO.					1985	11,840	2,508	0	14,348
ALL RESIDENTIAL	227,465		39.0	40	1986	3,730	1,174	0	4,904
HOUSEHEATING ONLY	189,723	78.3							
HEATING DEGREE DAYS		4,741							
ELIZABETHTOWN GAS CO.					1985	2,695	2,088	NA	NA
ALL RESIDENTIAL	192,235		29.0	60	1986	3,000	2,400	NA	NA
HOUSEHEATING ONLY	116,426	109.6							
HEATING DEGREE DAYS		4,841							
PUBLIC SERVICE ELEC. & GAS					1985	17,238	14,925	10	32,153
ALL RESIDENTIAL	1,223,476		35.0	60	1986	20,000	12,500	10	32,490
HOUSEHEATING ONLY	751,600	101.0							
HEATING DEGREE DAYS		4,764							
MIDDLE ATLANTIC									
NEW YORK									
BROOKLYN UNION GAS CO.					1985	2,500	3,200	1,200	4,500
ALL RESIDENTIAL	1,051,008		41.0	50	1986	2,500	3,000	1,200	4,300
HOUSEHEATING ONLY	343,868	89.0							
HEATING DEGREE DAYS		4,246							
CENTRAL HUDSON GAS & ELEC.					1985	780	540	NA	NA
ALL RESIDENTIAL	46,321		50.0	16	1986	650	500	NA	NA
HOUSEHEATING ONLY	31,546	85.0							
HEATING DEGREE DAYS		6,232							

DIVISION / STATE / COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEATING	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
MIDDLE ATLANTIC									
NEW YORK									
CONSOLIDATED EDISON OF NY									
ALL RESIDENTIAL	935,961		83.0	50	1985	613	2,506	NA	NA
HOUSEHEATING ONLY	170,561	125.0			1986	500	3,000	NA	NA
HEATING DEGREE DAYS		4,390							
NATIONAL FUEL GAS DISTR.									
ALL RESIDENTIAL	461,608		41.0	87	1985	1,712	793	521	1,984
HOUSEHEATING ONLY	443,751	90.0			1986	1,861	890	566	2,185
HEATING DEGREE DAYS		6,313							
LONG ISLAND LIGHTING CO.									
ALL RESIDENTIAL	371,323		35.9	22	1985	1,198	2,497	NA	NA
HOUSEHEATING ONLY	184,238	105.6			1986	1,200	3,150	NA	NA
HEATING DEGREE DAYS		4,664							
NEW YORK STATE ELEC. & GAS									
ALL RESIDENTIAL	112,262		43.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	103,622	122.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		7,300							
ROCHESTER GAS & ELECTRIC									
ALL RESIDENTIAL	223,202		34.4	NA	1985	2,662	2,181	NA	NA
HOUSEHEATING ONLY	196,035	92.2			1986	3,100	1,300	NA	NA
HEATING DEGREE DAYS		6,451							
COLUMBIA GAS OF NEW YORK									
ALL RESIDENTIAL	59,010		40.0	70	1985	336	84	38	382
HOUSEHEATING ONLY	53,944	70.0			1986	385	90	35	440
HEATING DEGREE DAYS		6,911							
ST. LAWRENCE GAS CO.									
ALL RESIDENTIAL	9,710		34.0	76	1985	18	201	10	209
HOUSEHEATING ONLY	8,624	122.0			1986	10	145	10	145
HEATING DEGREE DAYS		8,340							
MIDDLE ATLANTIC									
PENNSYLVANIA									
NATIONAL FUEL GAS DISTR.									
ALL RESIDENTIAL	184,613		38.0	73	1985	528	178	214	492
HOUSEHEATING ONLY	182,165	93.0			1986	575	194	233	536
HEATING DEGREE DAYS		5,840							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
MIDDLE ATLANTIC									
PENNSYLVANIA									
NORTH PENN GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	27,678		39.0	NA	1956	NA	NA	NA	NA
HOUSEHEATING ONLY	27,546	71.0							
HEATING DEGREE DAYS		6,773							
THE PEOPLES NATURAL GAS CO.					1985	1,610	358	751	1,417
ALL RESIDENTIAL	301,356		50.0	NA	1986	2,241	319	751	1,809
HOUSEHEATING ONLY	293,296	89.0							
HEATING DEGREE DAYS		5,741							
PHILADELPHIA ELECTRIC CO.					1985	2,757	2,247	100	4,904
ALL RESIDENTIAL	287,472		28.0	33	1986	NA	NA	100	NA
HOUSEHEATING ONLY	217,840	110.0							
HEATING DEGREE DAYS		4,771							
PHILADELPHIA GAS WORKS					1985	2,750	2,378	1,000	4,128
ALL RESIDENTIAL	506,445		48.0	72	1986	2,300	2,400	1,000	3,700
HOUSEHEATING ONLY	393,929	113.0							
HEATING DEGREE DAYS		4,428							
PENNSYLVANIA GAS & WATER					1985	157	1,633	490	1,300
ALL RESIDENTIAL	106,925		24.0	51	1986	250	1,660	461	1,449
HOUSEHEATING ONLY	84,234	137.0							
HEATING DEGREE DAYS		6,209							
UGI CORPORATION					1985	1,583	1,806	140	3,249
ALL RESIDENTIAL	189,361		28.0	25	1986	1,600	1,750	160	3,190
HOUSEHEATING ONLY	119,429	75.0							
HEATING DEGREE DAYS		4,958							
COLUMBIA GAS OF PENNSYLVANIA					1985	1,468	444	1,391	521
ALL RESIDENTIAL	305,568		40.0	70	1986	1,565	685	1,400	950
HOUSEHEATING ONLY	287,833	70.0							
HEATING DEGREE DAYS		5,399							
EAST NORTH CENTRAL									
ILLINOIS									
CENTRAL ILLINOIS LIGHT CO.					1985	600	270	300	570
ALL RESIDENTIAL	167,332		16.0	90	1986	750	160	200	710
HOUSEHEATING ONLY	162,596	120.0							
HEATING DEGREE DAYS		6,344							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
EAST NORTH CENTRAL									
ILLINOIS									
CENTRAL IL PUBLIC SERVICE					1985	200	100	235	62
ALL RESIDENTIAL	139,953		21.0	80	1986	300	100	125	275
HOUSEHEATING ONLY	136,342	93.0							
HEATING DEGREE DAYS		5,837							
ILLINOIS POWER CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	348,994		23.9	77	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	338,636	86.4							
HEATING DEGREE DAYS		5,343							
IOWA-ILLINOIS GAS & ELEC.					1985	172	8	123	57
ALL RESIDENTIAL	59,003		13.7	86	1986	75	NA	25	NA
HOUSEHEATING ONLY	56,687	107.4							
HEATING DEGREE DAYS		6,294							
NORTH SHORE GAS CO.					1985	1,225	639	100	1,764
ALL RESIDENTIAL	96,293		41.0	91	1986	1,400	620	100	1,920
HOUSEHEATING ONLY	91,152	144.0							
HEATING DEGREE DAYS		6,830							
PEOPLES GAS LIGHT & COKE					1985	2,700	3,500	2,400	3,800
ALL RESIDENTIAL	810,569		39.0	94	1986	3,000	4,000	2,100	4,900
HOUSEHEATING ONLY	573,649	143.0							
HEATING DEGREE DAYS		6,799							
NORTHERN ILLINOIS GAS CO.					1985	24,701	2,965	5,000	22,667
ALL RESIDENTIAL	1,370,327		35.0	85	1986	26,000	3,000	5,000	24,000
HOUSEHEATING ONLY	1,307,970	119.0							
HEATING DEGREE DAYS		6,129							
UNITED CITIES GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	16,666		24.0	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	16,170	67.0							
HEATING DEGREE DAYS		4,785							
EAST NORTH CENTRAL									
INDIANA									
CITIZENS GAS & COKE					1985	NA	NA	NA	NA
ALL RESIDENTIAL	203,084		43.0	78	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	192,566	97.0							
HEATING DEGREE DAYS		5,655							

DIVISION STATE COMPANY	CUSTOMERS	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR)		GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS				
	YEAR-END	HEAT-ING	BASE-LOAD		YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
EAST NORTH CENTRAL									
INDIANA									
HOOSIER GAS CORP.					1985	135	61	120	76
ALL RESIDENTIAL	20,664		26.0	NA	1986	120	42	120	42
HOUSEHEATING ONLY	20,459	78.2							
HEATING DEGREE DAYS		5,025							
INDIANA GAS CO.					1985	2,437	2,942	725	4,674
ALL RESIDENTIAL	289,511		30.3	81	1986	3,100	3,750	850	6,000
HOUSEHEATING ONLY	284,486	85.2							
HEATING DEGREE DAYS		5,656							
KOKOMO GAS & FUEL CO.					1985	NA	55	NA	NA
ALL RESIDENTIAL	25,988		33.6	95	1986	NA	65	NA	NA
HOUSEHEATING ONLY	25,590	117.5							
HEATING DEGREE DAYS		5,853							
LAWRENCEBURG GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	3,600		27.0	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	3,571	88.0							
HEATING DEGREE DAYS		5,126							
NORTHERN IN PUBLIC SERVICE					1985	3,000	2,000	NA	NA
ALL RESIDENTIAL	501,361		48.0	85	1986	5,000	2,100	NA	NA
HOUSEHEATING ONLY	481,243	98.3							
HEATING DEGREE DAYS		6,327							
OHIO VALLEY GAS CORP.					1985	124	114	69	169
ALL RESIDENTIAL	21,586		26.0	97	1986	72	119	91	100
HOUSEHEATING ONLY	21,184	105.0							
HEATING DEGREE DAYS		5,709							
SOUTHERN IN GAS & ELECTRIC					1985	NA	NA	NA	NA
ALL RESIDENTIAL	60,360		33.2	63	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	59,363	107.0							
HEATING DEGREE DAYS		4,785							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	HEAT-ING	BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
EAST NORTH CENTRAL									
MICHIGAN									
BATTLE CREEK GAS CO.					1985	31	279	100	210
ALL RESIDENTIAL	29,521		34.0	95	1986	40	127	NA	NA
HOUSEHEATING ONLY	28,091	105.2							
HEATING DEGREE DAYS		5,725							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
EAST NORTH CENTRAL									
MICHIGAN									
CONSUMERS POWER CO.					1985	20,105	500	350	20,255
ALL RESIDENTIAL	1,137,052		30.3	96	1986	20,000	500	350	20,150
HOUSEHEATING ONLY	1,102,822	111.1							
HEATING DEGREE DAYS		6,287							
LAKE SUPERIOR DIST. POWER					1985	NA	NA	15	NA
ALL RESIDENTIAL	3,064		22.2	46	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	3,583	100.2							
HEATING DEGREE DAYS		9,717							
MICHIGAN CONSOLIDATED GAS					1985	5,650	2,040	NA	NA
ALL RESIDENTIAL	982,467		45.0	85	1986	6,000	2,000	NA	NA
HOUSEHEATING ONLY	940,614	110.0							
HEATING DEGREE DAYS		6,689							
MICHIGAN POWER CO.					1985	1,042	500	25	1,517
ALL RESIDENTIAL	65,303		28.8	66	1986	649	312	16	945
HOUSEHEATING ONLY	64,496	90.5							
HEATING DEGREE DAYS		6,487							
MICHIGAN GAS UTILITIES CO.					1985	953	1,157	0	2,110
ALL RESIDENTIAL	101,240		32.5	58	1986	685	605	0	1,290
HOUSEHEATING ONLY	99,300	91.4							
HEATING DEGREE DAYS		6,543							
WISCONSIN PUBLIC SERVICE					1985	NA	NA	NA	NA
ALL RESIDENTIAL	4,346		32.0	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	4,125	89.0							
HEATING DEGREE DAYS		8,195							
EAST NORTH CENTRAL									
OHIO									
CINCINNATI GAS & ELECTRIC					1985	NA	NA	NA	NA
ALL RESIDENTIAL	272,031		35.0	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	251,802	89.0							
HEATING DEGREE DAYS		5,247							
DAYTON POWER & LIGHT CO.					1985	1,710	NA	NA	NA
ALL RESIDENTIAL	246,359		NA	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	241,897	NA							
HEATING DEGREE DAYS		5,474							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
EAST NORTH CENTRAL									
OHIO									
EAST OHIO GAS CO.									
ALL RESIDENTIAL	934,730		40.0	99	1985	6,132	1,693	2,986	4,839
HOUSEHEATING ONLY	924,955	100.0			1986	6,500	1,900	3,000	5,400
HEATING DEGREE DAYS		5,979							
NATIONAL GAS & OIL CORP.									
ALL RESIDENTIAL	13,868		48.7	90	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	13,868	67.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		6,425							
NATIONAL FUEL GAS DISTR.									
ALL RESIDENTIAL	5,356		37.0	78	1985	15	5	6	16
HOUSEHEATING ONLY	5,286	91.0			1986	16	6	7	15
HEATING DEGREE DAYS		5,840							
OHIO GAS CO.									
ALL RESIDENTIAL	31,400		40.0	50	1985	75	160	22	213
HOUSEHEATING ONLY	27,810	129.0			1986	75	200	30	245
HEATING DEGREE DAYS		5,680							
WEST OHIO GAS CO.									
ALL RESIDENTIAL	49,650		27.6	85	1985	209	157	0	366
HOUSEHEATING ONLY	48,516	91.4			1986	150	140	90	200
HEATING DEGREE DAYS		5,091							
COLUMBIA GAS OF OHIO									
ALL RESIDENTIAL	999,436		40.0	70	1985	10,021	1,726	3,622	8,125
HOUSEHEATING ONLY	989,442	70.0			1986	10,550	1,925	2,925	9,550
HEATING DEGREE DAYS		5,666							
EAST NORTH CENTRAL									
WISCONSIN									
LAKE SUPERIOR DIST. POWER									
ALL RESIDENTIAL	6,248		25.2	22	1985	31	65	31	65
HOUSEHEATING ONLY	6,086	97.1			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		9,039							
MADISON GAS & ELECTRIC CO.									
ALL RESIDENTIAL	65,678		31.0	72	1985	1,610	803	NA	NA
HOUSEHEATING ONLY	59,714	90.0			1986	1,423	710	NA	NA
HEATING DEGREE DAYS		7,821							

DIVISION STATE COMPANY	CUSTOMERS	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR)		GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS				
	YEAR-END	HEAT-ING	BASE-LOAD		YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
EAST NORTH CENTRAL									
WISCONSIN									
WISCONSIN GAS CO.									
ALL RESIDENTIAL	356,740		35.0	76	1985	1,423	4,225	948	4,800
HOUSEHEATING ONLY	340,835	93.0			1986	1,200	3,577	NA	NA
HEATING DEGREE DAYS		7,325							
NORTHERN STATES POWER CO.									
ALL RESIDENTIAL	29,470		21.4	20	1985	406	686	138	954
HOUSEHEATING ONLY	25,485	79.9			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		8,142							
WISCONSIN FUEL & LIGHT CO.									
ALL RESIDENTIAL	35,159		NA	74	1985	220	268	20	468
HOUSEHEATING ONLY	33,339	NA			1986	250	248	21	477
HEATING DEGREE DAYS		8,313							
WISCONSIN PUBLIC SERVICE									
ALL RESIDENTIAL	141,171		32.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	133,432	89.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		8,195							
WISCONSIN SOUTHERN GAS CO.									
ALL RESIDENTIAL	35,645		31.0	81	1985	272	313	20	565
HOUSEHEATING ONLY	34,426	91.0			1986	300	415	20	695
HEATING DEGREE DAYS		7,790							
WISCONSIN NATURAL GAS CO.									
ALL RESIDENTIAL	210,709		16.2	71	1985	2,400	1,900	NA	NA
HOUSEHEATING ONLY	194,285	100.0			1986	2,600	2,300	NA	NA
HEATING DEGREE DAYS		7,727							
WEST NORTH CENTRAL									
IOWA									
CEDAR FALLS UTILITIES									
ALL RESIDENTIAL	9,065		NA	68	1985	2	13	4	11
HOUSEHEATING ONLY	8,511	NA			1986	10	37	4	43
HEATING DEGREE DAYS		6,674							
IOWA ELECTRIC LIGHT & POWER									
ALL RESIDENTIAL	114,974		28.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	112,437	89.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		6,798							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) BASE-LOAD	GAS-HTG MKT SHARE VS. ALL FUELS (%)	GAS-HTG HOUSING UNIT ADDITIONS YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
WEST NORTH CENTRAL									
IOWA									
IOWA-ILLINOIS GAS & ELECTRIC									
ALL RESIDENTIAL	147,936		15.8	85	1985	948	60	610	399
HOUSEHEATING ONLY	142,541	98.8			1986	500	NA	100	NA
HEATING DEGREE DAYS		6,796							
IOWA GAS CO.									
ALL RESIDENTIAL	122,949		32.0	65	1985	1,512	670	129	2,053
HOUSEHEATING ONLY	119,853	88.0			1986	1,700	680	129	2,251
HEATING DEGREE DAYS		4,959							
IOWA PUBLIC SERVICE CO.									
ALL RESIDENTIAL	96,091		NA	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	89,222	NA			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		7,482							
NORTH CENTRAL PUBLIC SERVICE									
ALL RESIDENTIAL	11,236		22.0	90	1985	12	36	39	9
HOUSEHEATING ONLY	11,130	89.0			1986	11	18	31	-2
HEATING DEGREE DAYS		6,974							
WEST NORTH CENTRAL									
KANSAS									
ARKANSAS LOUISIANA GAS CO.									
ALL RESIDENTIAL	14,383		35.7	61	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	13,773	59.3			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		5,093							
MIDWEST ENERGY, INC.									
ALL RESIDENTIAL	9,230		30.8	90	1985	55	NA	NA	NA
HOUSEHEATING ONLY	9,230	114.3			1986	40	NA	NA	NA
HEATING DEGREE DAYS		5,793							
KPL GAS SERVICE									
ALL RESIDENTIAL	504,596		30.0	90	1985	5,650	350	NA	NA
HOUSEHEATING ONLY	504,596	90.0			1986	6,000	350	NA	NA
HEATING DEGREE DAYS		5,918							
KN ENERGY, INC.									
ALL RESIDENTIAL	23,468		38.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	22,939	88.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		6,764							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
WEST NORTH CENTRAL									
MINNESOTA									
AUSTIN UTILITIES					1985	4	0	2	6
ALL RESIDENTIAL	8,875		23.0	98	1986	10	3	5	5
HOUSEHEATING ONLY	8,491	130.0							
HEATING DEGREE DAYS		8,224							
CITY OF DULUTH					1985	7	255	150	112
ALL RESIDENTIAL	19,557		45.0	80	1986	30	400	150	280
HOUSEHEATING ONLY	12,817	140.0							
HEATING DEGREE DAYS		10,204							
NORTHERN STATES POWER CO.					1985	3,064	2,147	25	5,188
ALL RESIDENTIAL	221,565		25.0	71	1986	3,100	2,420	25	5,495
HOUSEHEATING ONLY	205,006	115.0							
HEATING DEGREE DAYS		8,363							
NORTH CENTRAL PUBLIC SERVICE					1985	5,278	500	0	5,778
ALL RESIDENTIAL	47,399		36.0	85	1986	5,000	500	0	5,500
HOUSEHEATING ONLY	47,048	117.0							
HEATING DEGREE DAYS		9,097							
MINNEGASCO, INC.					1985	11,930	790	NA	NA
ALL RESIDENTIAL	400,291		35.0	82	1986	10,655	650	NA	NA
HOUSEHEATING ONLY	390,607	130.6							
HEATING DEGREE DAYS		8,208							
WEST NORTH CENTRAL									
MISSOURI									
KPL GAS SERVICE					1985	5,950	350	NA	NA
ALL RESIDENTIAL	385,238		30.0	90	1986	5,900	350	NA	NA
HOUSEHEATING ONLY	385,238	90.0							
HEATING DEGREE DAYS		5,919							
LACLEDE GAS CO.					1985	5,900	NA	100	NA
ALL RESIDENTIAL	533,896		42.5	90	1986	6,000	NA	400	NA
HOUSEHEATING ONLY	516,919	71.1							
HEATING DEGREE DAYS		4,925							
CITY OF SPRINGFIELD					1985	NA	NA	NA	NA
ALL RESIDENTIAL	51,262		32.0	82	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	51,262	49.0							
HEATING DEGREE DAYS		4,883							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTD NET SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
WEST NORTH CENTRAL									
MISSOURI									
ASSOCIATED NATURAL GAS CO.									
ALL RESIDENTIAL	37,309		NA	NA	1985	499	NA	0	NA
HOUSEHEATING ONLY	37,309	56.6			1986	300	NA	0	NA
HEATING DEGREE DAYS		3,891							
WEST NORTH CENTRAL									
NEBRASKA									
HASTINGS UTILITIES									
ALL RESIDENTIAL	7,939		NA	99	1985	28	0	12	16
HOUSEHEATING ONLY	7,939	119.5			1986	30	0	10	20
HEATING DEGREE DAYS		5,971							
IOWA PUBLIC SERVICE CO.									
ALL RESIDENTIAL	3,422		NA	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	3,325	NA			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		7,482							
KN ENERGY, INC.									
ALL RESIDENTIAL	80,519		32.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	78,909	82.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		7,377							
METROPOLITAN UTILITIES DIST.									
ALL RESIDENTIAL	125,610		45.0	66	1985	2,100	100	200	2,000
HOUSEHEATING ONLY	122,115	83.0			1986	1,900	50	250	1,700
HEATING DEGREE DAYS		6,748							
NORTHWESTERN PUBLIC SERVICE									
ALL RESIDENTIAL	32,423		60.0	99	1985	0	0	0	0
HOUSEHEATING ONLY	32,307	90.0			1986	150	0	0	150
HEATING DEGREE DAYS		6,965							
MINNEGASCO, INC.									
ALL RESIDENTIAL	104,062		30.0	94	1985	1,196	134	374	956
HOUSEHEATING ONLY	102,490	73.6			1986	930	50	360	520
HEATING DEGREE DAYS		6,522							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
WEST NORTH CENTRAL									
NORTH DAKOTA									
MONTANA-DAKOTA UTILITIES CO.					1985	64	35	50	49
ALL RESIDENTIAL	64,093		32.4	96	1986	200	70	50	220
HOUSEHEATING ONLY	63,452	97.1							
HEATING DEGREE DAYS		9,495							
NORTHERN STATES POWER CO.					1985	176	479	50	605
ALL RESIDENTIAL	15,639		34.0	43	1986	200	530	50	680
HOUSEHEATING ONLY	14,992	115.0							
HEATING DEGREE DAYS		9,584							
WEST NORTH CENTRAL									
SOUTH DAKOTA									
IOWA PUBLIC SERVICE CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	7,236		NA	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	6,655	NA							
HEATING DEGREE DAYS		7,492							
MONTANA-DAKOTA UTILITIES CO.					1985	354	1	75	280
ALL RESIDENTIAL	26,461		30.3	96	1986	300	0	0	300
HOUSEHEATING ONLY	26,196	73.1							
HEATING DEGREE DAYS		7,857							
NORTHWESTERN PUBLIC SERVICE					1985	0	0	0	0
ALL RESIDENTIAL	25,074		30.0	75	1986	100	0	0	100
HOUSEHEATING ONLY	23,984	90.0							
HEATING DEGREE DAYS		8,264							
MINNEGASCO, INC.					1985	782	39	20	801
ALL RESIDENTIAL	34,985		32.0	90	1986	680	65	20	725
HOUSEHEATING ONLY	34,649	89.0							
HEATING DEGREE DAYS		6,090							
SOUTH ATLANTIC									
DISTRICT OF COLUMBIA									
WASHINGTON GAS LIGHT CO.					1985	200	3,200	1,200	2,200
ALL RESIDENTIAL	132,169		35.0	72	1986	400	2,000	1,200	1,200
HOUSEHEATING ONLY	99,379	76.0							
HEATING DEGREE DAYS		3,658							

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*                                 *           * CONSUMPTION PER   *  GAS-HTD   *     GAS-HTD HOUSING UNIT ADDITIONS      *
*DIVISION                         * CUSTOMERS * SINGLE FAMILY HOME * MKT SHARE *                                          *
*        STATE                    *           *     (MCF/YR)      *    VS.    * YEAR *  NEW  *  CON-  *  LESS  *  NET   *
*               COMPANY           * YEAR-END  *  HEAT-  *  BASE-  * ALL FUELS *      * CONST *  VER-  * LOSSES* ADDI-  *
*                                 *           *   ING   *  LOAD   *    (%)    *      *       * SIONS  *        * TIONS  *
********************************* * ********* * ******* * ******* * ********* * **** * ***** * ***** * ***** * ***** *
 SOUTH ATLANTIC
   DELAWARE

    DELMARVA POWER & LIGHT CO.                                                  1985      89   1,229      NA      NA
           ALL RESIDENTIAL           70,804                  28.3        37      1986     300     475      NA      NA
           HOUSEHEATING ONLY         49,492      74.1
           HEATING DEGREE DAYS                         6,453

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 SOUTH ATLANTIC
   FLORIDA

    PEOPLES GAS SYSTEM, INC.                                                    1985     392   1,037   1,058     371
           ALL RESIDENTIAL          151,237                  18.0        37      1986     500     950   2,000    -550
           HOUSEHEATING ONLY        114,723      21.0
           HEATING DEGREE DAYS                           178

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 SOUTH ATLANTIC
   GEORGIA

    ATLANTA GAS LIGHT CO.                                                       1985  37,446      NA      NA      NA
           ALL RESIDENTIAL          880,760                  40.0        68      1986  35,000      NA      NA      NA
           HOUSEHEATING ONLY        844,950      47.0
           HEATING DEGREE DAYS                         2,663

    UNITED CITIES GAS CO.                                                       1985      NA      NA      NA      NA
           ALL RESIDENTIAL           57,319                  23.5        NA      1986      NA      NA      NA      NA
           HOUSEHEATING ONLY         57,226      46.5
           HEATING DEGREE DAYS                         2,245

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 SOUTH ATLANTIC
   MARYLAND

    BALTIMORE GAS & ELECTRIC                                                    1985   1,375   4,025     300   5,100
           ALL RESIDENTIAL          481,128                  42.1        40      1986   1,350   2,500     300   3,550
           HOUSEHEATING ONLY        347,196      71.7
           HEATING DEGREE DAYS                         4,344

    WASHINGTON GAS LIGHT CO.                                                    1985   2,800   1,600     800   3,600
           ALL RESIDENTIAL          225,102                  34.7        71      1986   3,800   1,300     800   4,300
           HOUSEHEATING ONLY        216,941      72.1
           HEATING DEGREE DAYS                         3,899
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DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
SOUTH ATLANTIC									
MARYLAND									
COLUMBIA GAS OF MARYLAND					1985	78	40	302	-164
ALL RESIDENTIAL	25,850		40.0	70	1986	65	50	270	-135
HOUSEHEATING ONLY	21,963	70.0							
HEATING DEGREE DAYS		5,123							
SOUTH ATLANTIC									
NORTH CAROLINA									
PIEDMONT NATURAL GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	157,106		14.1	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	153,964	70.5							
HEATING DEGREE DAYS		3,449							
PUBLIC SERVICE OF NC					1985	4,450	5,050	328	9,172
ALL RESIDENTIAL	158,403		24.1	27	1986	4,000	4,700	300	8,400
HOUSEHEATING ONLY	147,882	78.2							
HEATING DEGREE DAYS		3,313							
CITY OF WILSON					1985	82	30	NA	NA
ALL RESIDENTIAL	5,975		3.6	23	1986	50	27	NA	NA
HOUSEHEATING ONLY	5,610	66.2							
HEATING DEGREE DAYS		90							
NORTH CAROLINA NATURAL GAS					1985	NA	NA	NA	NA
ALL RESIDENTIAL	58,665		16.0	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	56,236	52.0							
HEATING DEGREE DAYS		2,757							
SOUTH ATLANTIC									
SOUTH CAROLINA									
PIEDMONT NATURAL GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	48,022		18.2	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	47,061	62.8							
HEATING DEGREE DAYS		3,205							
SOUTH CAROLINA ELEC. & GAS					1985	NA	NA	NA	NA
ALL RESIDENTIAL	174,001		15.0	68	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	152,547	52.4							
HEATING DEGREE DAYS		2,492							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	YEAR	GAS-HTD HOUSING UNIT ADDITIONS NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
SOUTH ATLANTIC									
SOUTH CAROLINA									
UNITED CITIES GAS CO.									
ALL RESIDENTIAL	3,456		22.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	3,180	46.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		3,096							
SOUTH ATLANTIC									
VIRGINIA									
CITY OF CHARLOTTESVILLE									
ALL RESIDENTIAL	12,503		50.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	12,509	110.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		NA							
CITY OF DANVILLE									
ALL RESIDENTIAL	13,992		22.6	70	1985	60	65	10	115
HOUSEHEATING ONLY	12,4[illegible]	59.1			1986	100	90	10	180
HEATING DEGREE DAYS		3,607							
CITY OF RICHMOND									
ALL RESIDENTIAL	67,273		34.3	NA	1985	248	607	NA	NA
HOUSEHEATING ONLY	52,174	46.1			1986	400	300	NA	NA
HEATING DEGREE DAYS		3,630							
ROANOKE GAS CO.									
ALL RESIDENTIAL	31,542		31.2	NA	1985	420	237	153	504
HOUSEHEATING ONLY	26,379	[illegible]			1986	575	150	NA	NA
HEATING DEGREE DAYS		3,491							
UNITED CITIES GAS CO.									
ALL RESIDENTIAL	1,204		22.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	1,110	86.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		4,256							
COLUMBIA GAS OF VIRGINIA									
ALL RESIDENTIAL	35,930		40.0	70	1985	431	109	762	-222
HOUSEHEATING ONLY	34,955	70.0			1986	450	150	250	350
HEATING DEGREE DAYS		4,224							
WASHINGTON GAS LIGHT CO.									
ALL RESIDENTIAL	177,431		30.2	59	1985	3,800	1,600	600	4,800
HOUSEHEATING ONLY	166,220	66.5			1986	NA	1,300	600	NA
HEATING DEGREE DAYS		3,905							

DIVISION / STATE / COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
SOUTH ATLANTIC									
WEST VIRGINIA									
HOPE NATURAL GAS CO.									
ALL RESIDENTIAL	102,181		33.7	NA	1985	232	15	613	-365
HOUSEHEATING ONLY	97,607	76.7			1986	200	40	NA	NA
HEATING DEGREE DAYS		4,927							
EAST SOUTH CENTRAL									
ALABAMA									
ALABAMA GAS CORP.									
ALL RESIDENTIAL	358,449		30.0	70	1985	4,123	486	2,100	2,509
HOUSEHEATING ONLY	347,696	55.0			1986	4,500	525	2,100	2,925
HEATING DEGREE DAYS		2,890							
CITY OF HUNTSVILLE									
ALL RESIDENTIAL	24,021		NA	60	1985	258	335	121	472
HOUSEHEATING ONLY	24,021	NA			1986	300	212	140	372
HEATING DEGREE DAYS		3,442							
DECATUR UTILITIES									
ALL RESIDENTIAL	4,100		11.0	22	1985	8	10	4	14
HOUSEHEATING ONLY	4,055	45.0			1986	40	10	4	46
HEATING DEGREE DAYS		3,152							
CITY OF FLORENCE									
ALL RESIDENTIAL	7,230		NA	50	1985	NA	NA	29	NA
HOUSEHEATING ONLY	7,230	NA			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		2,923							
SOUTHEAST ALABAMA GAS DIST.									
ALL RESIDENTIAL	31,060		18.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	31,060	60.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		1,955							
EAST SOUTH CENTRAL									
KENTUCKY									
COLUMBIA GAS OF KENTUCKY									
ALL RESIDENTIAL	102,345		40.0	70	1985	1,033	96	1,043	55
HOUSEHEATING ONLY	101,673	70.0			1986	865	100	1,010	-45
HEATING DEGREE DAYS		4,500							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTG MKT SHARE VS. ALL FUELS (%)	GAS-HTG HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
EAST SOUTH CENTRAL									
KENTUCKY									
LOUISVILLE GAS & ELECTRIC									
ALL RESIDENTIAL	216,197		35.0	NA	1985	1,600	150	964	836
HOUSEHEATING ONLY	211,478	67.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		4,451							
UNION LIGHT, HEAT & POWER									
ALL RESIDENTIAL	55,833		33.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	52,831	93.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		5,126							
WESTERN KENTUCKY GAS CO.									
ALL RESIDENTIAL	126,041		33.3	NA	1985	1,053	650	97	1,606
HOUSEHEATING ONLY	113,436	61.9			1986	1,200	1,300	NA	NA
HEATING DEGREE DAYS		3,983							
DELTA NATURAL GAS CO.									
ALL RESIDENTIAL	24,786		36.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	NA	54.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		4,346							
EAST SOUTH CENTRAL									
MISSISSIPPI									
ENTEX, INC.									
ALL RESIDENTIAL	96,763		30.0	82	1985	335	120	40	415
HOUSEHEATING ONLY	92,621	38.0			1986	400	250	40	610
HEATING DEGREE DAYS		2,522							
EAST SOUTH CENTRAL									
TENNESSEE									
MEMPHIS LIGHT, GAS & WATER									
ALL RESIDENTIAL	224,827		30.0	80	1985	2,276	NA	NA	NA
HOUSEHEATING ONLY	216,733	81.0			1986	2,500	NA	NA	NA
HEATING DEGREE DAYS		3,255							
NASHVILLE GAS CO.									
ALL RESIDENTIAL	57,619		30.0	24	1985	2,100	1,032	796	2,346
HOUSEHEATING ONLY	56,663	65.0			1986	3,000	1,050	1,000	3,050
HEATING DEGREE DAYS		3,832							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
EAST SOUTH CENTRAL									
TENNESSEE									
UNITED CITIES GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	29,649		27.0	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	29,060	55.0							
HEATING DEGREE DAYS		3,909							
MIDDLE TENNESSEE NATURAL GAS					1985	150	950	40	1,060
ALL RESIDENTIAL	10,434		12.0	22	1986	150	510	40	620
HOUSEHEATING ONLY	9,980	62.0							
HEATING DEGREE DAYS		3,332							
JACKSON UTILITY DIVISION					1985	209	83	15	277
ALL RESIDENTIAL	15,159		22.0	71	1986	413	95	15	493
HOUSEHEATING ONLY	14,690	63.0							
HEATING DEGREE DAYS		3,805							
WEST SOUTH CENTRAL									
ARKANSAS									
ARKANSAS LOUISIANA GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	352,809		34.6	50	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	262,843	52.4							
HEATING DEGREE DAYS		3,256							
ARKANSAS WESTERN GAS CO.					1985	1,500	NA	NA	NA
ALL RESIDENTIAL	66,825		36.2	45	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	64,903	54.4							
HEATING DEGREE DAYS		4,623							
ARKANSAS OKLAHOMA GAS CORP.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	32,659		15.0	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	32,559	85.0							
HEATING DEGREE DAYS		3,644							
ASSOCIATED NATURAL GAS CO.					1985	522	NA	0	NA
ALL RESIDENTIAL	16,836		NA	NA	1986	400	NA	0	NA
HOUSEHEATING ONLY	16,836	81.7							
HEATING DEGREE DAYS		3,391							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
WEST SOUTH CENTRAL									
LOUISIANA									
ARKANSAS LOUISIANA GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	129,724		28.2	64	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	103,909	46.8							
HEATING DEGREE DAYS		2,364							
NEW ORLEANS PUBLIC SERVICE					1985	NA	NA	NA	NA
ALL RESIDENTIAL	156,452		NA	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	154,887	NA							
HEATING DEGREE DAYS		1,343							
ENTEX, INC.					1985	1,389	200	50	1,539
ALL RESIDENTIAL	121,246		30.0	80	1986	900	350	50	1,200
HOUSEHEATING ONLY	115,849	33.0							
HEATING DEGREE DAYS		1,716							
WEST SOUTH CENTRAL									
OKLAHOMA									
ARKANSAS LOUISIANA GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	107,756		31.2	56	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	83,295	51.8							
HEATING DEGREE DAYS		4,019							
ARKANSAS OKLAHOMA GAS CORP.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	13,240		15.0	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	13,240	73.0							
HEATING DEGREE DAYS		3,644							
KPL GAS SERVICE					1985	100	20	NA	NA
ALL RESIDENTIAL	32,996		30.0	90	1986	100	20	NA	NA
HOUSEHEATING ONLY	32,996	90.0							
HEATING DEGREE DAYS		5,915							
LONE STAR GAS CO.					1985	250	30	625	-345
ALL RESIDENTIAL	32,775		25.0	58	1986	250	30	625	-345
HOUSEHEATING ONLY	29,175	55.0							
HEATING DEGREE DAYS		2,475							
OKLAHOMA NATURAL GAS CO.					1985	6,800	300	2,500	4,600
ALL RESIDENTIAL	593,840		30.0	87	1986	6,400	400	2,500	4,300
HOUSEHEATING ONLY	592,960	70.0							
HEATING DEGREE DAYS		3,970							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
WEST SOUTH CENTRAL									
TEXAS									
ARKANSAS LOUISIANA GAS CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	53,515		25.2	5C	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	40,725	41.3							
HEATING DEGREE DAYS		2,354							
LONE STAR GAS CO.					1985	12,650	850	4,050	9,450
ALL RESIDENTIAL	1,060,15C		25.0	58	1986	12,650	85C	4,050	9,450
HOUSEHEATING ONLY	961,35C	55.C							
HEATING DEGREE DAYS		2,475							
CITY PUBLIC SERVICE					1985	3,167	0	943	2,246
ALL RESIDENTIAL	262,540		26.4	71	1986	5,118	0	1,515	3,603
HOUSEHEATING ONLY	241,537	29.6							
HEATING DEGREE DAYS		1,774							
ENTEX, INC.					1985	1,100	350	110	1,840
ALL RESIDENTIAL	935,207		30.0	60	1986	1,200	1,100	110	2,190
HOUSEHEATING ONLY	917,482	33.C							
HEATING DEGREE DAYS		1,760							
MOUNTAIN									
ARIZONA									
CITIZENS UTILITIES CO.					1985	88	C	0	88
ALL RESIDENTIAL	4,633		32.C	9C	1986	96	0	0	96
HOUSEHEATING ONLY	4,350	39.0							
HEATING DEGREE DAYS		2,400							
SOUTHWEST GAS CORP.					1985	5,791	200	2,546	3,445
ALL RESIDENTIAL	471,537		24.9	39	1986	4,500	30	3,114	1,416
HOUSEHEATING ONLY	397,995	32.9							
HEATING DEGREE DAYS		1,364							
MOUNTAIN									
COLORADO									
CITY OF COLORADO SPRINGS					1985	6,123	NA	NA	NA
ALL RESIDENTIAL	96,660		32.0	99	1986	4,500	NA	NA	NA
HOUSEHEATING ONLY	96,660	76.0							
HEATING DEGREE DAYS		6,513							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	 BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CON-VER-SIONS	 LESS LOSSES	 NET ADDI-TIONS
MOUNTAIN									
COLORADO									
KN ENERGY, INC.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	5,305		27.0	NA	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	5,199	80.0							
HEATING DEGREE DAYS		6,429							
PUBLIC SERVICE OF COLORADO					1985	20,141	NA	NA	NA
ALL RESIDENTIAL	693,390		33.8	75	1986	16,444	NA	NA	NA
HOUSEHEATING ONLY	693,390	96.0							
HEATING DEGREE DAYS		6,441							
MOUNTAIN									
IDAHO									
WASHINGTON WATER POWER					1985	158	240	NA	NA
ALL RESIDENTIAL	15,288		NA	20	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	14,020	NA							
HEATING DEGREE DAYS		9,023							
INTERMOUNTAIN GAS CO.					1985	1,151	1,415	624	1,942
ALL RESIDENTIAL	90,171		16.4	46	1986	1,154	1,543	NA	NA
HOUSEHEATING ONLY	90,171	65.5							
HEATING DEGREE DAYS		7,603							
MOUNTAIN									
MONTANA									
GREAT FALLS GAS CO.					1985	28	50	12	66
ALL RESIDENTIAL	20,739		32.8	97	1986	20	105	NA	NA
HOUSEHEATING ONLY	20,739	89.1							
HEATING DEGREE DAYS		8,554							
MONTANA-DAKOTA UTILITIES CO.					1985	722	13	100	640
ALL RESIDENTIAL	55,538		31.2	94	1986	500	10	100	410
HOUSEHEATING ONLY	54,982	87.9							
HEATING DEGREE DAYS		8,361							
MONTANA POWER CO.					1985	NA	NA	NA	NA
ALL RESIDENTIAL	90,541		NA	52	1986	NA	NA	NA	NA
HOUSEHEATING ONLY	90,541	110.0							
HEATING DEGREE DAYS		9,389							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEATING	 BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTD HOUSING UNIT ADDITIONS YEAR	 NEW CONST	 CONVERSIONS	 LESS LOSSES	 NET ADDITIONS
MOUNTAIN									
NEW MEXICO									
GAS CO. OF NEW MEXICO									
ALL RESIDENTIAL	283,530		24.0	32	1985	9,221	NA	NA	NA
HOUSEHEATING ONLY	283,530	53.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		4,253							
MOUNTAIN									
NEVADA									
SIERRA PACIFIC POWER CO.									
ALL RESIDENTIAL	55,019		25.9	64	1985	2,475	200	200	2,475
HOUSEHEATING ONLY	53,394	47.8			1986	2,500	150	150	2,500
HEATING DEGREE DAYS		5,952							
SOUTHWEST GAS CORP.									
ALL RESIDENTIAL	142,515		34.0	47	1985	4,022	142	24	4,140
HOUSEHEATING ONLY	119,212	45.4			1986	4,809	250	24	5,035
HEATING DEGREE DAYS		3,563							
MOUNTAIN									
WYOMING									
KN ENERGY, INC.									
ALL RESIDENTIAL	9,293		29.0	NA	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	9,107	79.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		8,190							
MONTANA-DAKOTA UTILITIES CO.									
ALL RESIDENTIAL	10,992		32.7	35	1985	17	5	20	2
HOUSEHEATING ONLY	10,882	91.2			1986	20	0	20	0
HEATING DEGREE DAYS		8,921							
WYOMING GAS CO.									
ALL RESIDENTIAL	5,211		33.0	40	1985	NA	NA	NA	NA
HOUSEHEATING ONLY	4,987	114.0			1986	NA	NA	NA	NA
HEATING DEGREE DAYS		7,618							
NORTHERN GAS DIVISION									
ALL RESIDENTIAL	39,653		33.0	90	1985	200	0	773	-578
HOUSEHEATING ONLY	39,663	96.0			1986	150	0	NA	NA
HEATING DEGREE DAYS		8,472							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	BASE-LOAD	GAS-HTD MKT SHARE VS. ALL FUELS (%)	GAS-HTG HOUSING UNIT ADDITIONS YEAR	NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
PACIFIC									
CALIFORNIA									
CITY OF LONG BEACH									
ALL RESIDENTIAL	122,387		67.0	97	1985	300	NA	NA	NA
HOUSEHEATING ONLY	119,343	34.0			1986	300	NA	NA	NA
HEATING DEGREE DAYS		715							
PACIFIC GAS & ELECTRIC CO.									
ALL RESIDENTIAL	2,888,611		22.2	77	1985	90,000	0	30,000	60,000
HOUSEHEATING ONLY	2,859,725	51.0			1986	100,000	0	31,000	69,000
HEATING DEGREE DAYS		1,796							
SAN DIEGO GAS & ELECTRIC									
ALL RESIDENTIAL	544,368		24.0	72	1985	14,000	0	0	14,000
HOUSEHEATING ONLY	516,234	24.0			1986	14,000	0	0	14,000
HEATING DEGREE DAYS		1,079							
SOUTHWEST GAS CORP.									
ALL RESIDENTIAL	54,322		27.9	75	1985	4,008	78	0	4,086
HOUSEHEATING ONLY	45,347	44.7			1986	5,830	180	5	5,975
HEATING DEGREE DAYS		4,006							
SOUTHERN CALIFORNIA GAS CO.									
ALL RESIDENTIAL	3,678,861		38.2	93	1985	85,400	NA	6,230	NA
HOUSEHEATING ONLY	3,794,760	32.6			1986	96,100	NA	6,350	NA
HEATING DEGREE DAYS		1,537							
PACIFIC									
OREGON									
NORTHWEST NATURAL GAS CO.									
ALL RESIDENTIAL	237,854		24.1	70	1985	3,000	1,813	1,500	3,318
HOUSEHEATING ONLY	217,564	62.0			1986	3,000	1,819	1,500	3,319
HEATING DEGREE DAYS		5,059							
PACIFIC									
WASHINGTON									
NORTHWEST NATURAL GAS CO.									
ALL RESIDENTIAL	5,623		24.1	6	1985	90	27	30	87
HOUSEHEATING ONLY	5,144	62.0			1986	90	27	30	87
HEATING DEGREE DAYS		5,059							

DIVISION STATE COMPANY	CUSTOMERS YEAR-END	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) HEAT-ING	CONSUMPTION PER SINGLE FAMILY HOME (MCF/YR) BASE-LOAD	GAS-HTG MKT SHARE VS. ALL FUELS (%)	YEAR	GAS-HTG HOUSING UNIT ADDITIONS NEW CONST	CON-VER-SIONS	LESS LOSSES	NET ADDI-TIONS
PACIFIC									
WASHINGTON									
WASHINGTON WATER POWER									
ALL RESIDENTIAL	53,700		NA	26	1975	541	141	NA	NA
HOUSEHEATING ONLY	52,547	61.7			1996	NA	NA	NA	NA
HEATING DEGREE DAYS			6,023						
WASHINGTON NATURAL GAS CO.									
ALL RESIDENTIAL	248,561		15.5	30	1995	4,870	5,317	854	9,333
HOUSEHEATING ONLY	240,937	52.2			1996	5,553	6,050	890	10,963
HEATING DEGREE DAYS			5,596						

APPENDIX 2

COMPETITIVE FUEL PRICES
(as of December 31, 1985)

The information in this section presents the average delivered price (as of December 31, 1985) of competitive fuels distributed to residential customers, gas' principal competition in each market, and the average annual gas heating bill. The data reflect prices in the principal city served within each company's franchise area. Regional fuel prices for competitive fuels are listed at the end of each division. Prices are expressed in dollars per million Btu for comparison.

The prices for natural gas represent househeating use only and exclude baseload prices. Baseload consumption includes all domestic uses of gas (e.g., ranges, water heaters, clothes dryers and air conditioning) except househeating. Moreover, baseload prices are generally higher than househeating prices because utilities charge more per unit of energy for small monthly consumption (baseload only) and less per unit of energy for large monthly consumption (baseload plus winter heating use).

Prices actually declined up to $.46/MMBtu in seven of the nine census divisions. The price declines ranged $.07 - $.46/MMBtu on a nominal basis compared to last year.

The prices for electricity represent total electric use or the rate prevailing for 600 Kwh per month and above.

The following conversion factors were used to convert reported data to Btu.

Conversion Factors

Natural Gas	1,000 cubic feet/million Btu
Fuel Oil #2	7.194 gallons/million Btu
Electricity	293.083 kwh/million Btu
Propane	10.917 gallons/million Btu

Information marked "NA" represents data not available or fuel not distributed.

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31: NATURAL GAS	FUEL OIL NO. 2	ELECTRIC	PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL(S)
NEW ENGLAND							
CONNECTICUT							
SOUTHERN CONNECTICUT GAS CO.	BRIDGEPORT	9.43	6.49	32.24	13.13	#2 OIL	867.00
CONNECTICUT NATURAL GAS	HARTFORD	7.60	8.25	21.91	9.39	#2 OIL	994.00
NORTHEAST UTILITIES	WATERBURY	8.52	6.47	20.17	6.73	#2 OIL	995.00
NEW ENGLAND							
MASSACHUSETTS							
BOSTON GAS CO.	BOSTON	6.61	5.72	25.21	11.16	#2 OIL	764.60
COLONIAL GAS CO.	CAPE COD	5.20	6.11	26.41	12.55	ELECTRIC	550.00
COMMONWEALTH GAS CO.	WORCESTER	5.10	5.35	27.84	13.10	#2 OIL	732.00
FALL RIVER GAS CO.	FALL RIVER	6.10	5.27	23.45	NA	#2 OIL	650.00
BAY STATE GAS CO.	BROCKTON	6.59	7.61	24.91	11.39	#2 OIL	584.00
ESSEX COUNTY GAS CO.	HAVERHILL	7.00	5.25	NA	10.70	#2 OIL	825.00
LOWELL GAS CO.	LOWELL	7.53	5.32	23.45	9.72	#2 OIL	803.00
NEW ENGLAND							
NEW HAMPSHIRE							
GAS SERVICE, INC.	NASHUA	7.06	4.96	32.24	11.16	#2 OIL	870.00
MANCHESTER GAS CO.	MANCHESTER	7.03	5.07	32.24	11.14	#2 OIL	680.00
NEW ENGLAND							
RHODE ISLAND							
VALLEY GAS CO.	PAWTUCKET	7.20	7.86	29.31	12.23	#2 OIL	862.00
THE PROVIDENCE GAS CO.	PROVIDENCE	7.28	5.77	21.96	10.54	#2 OIL	NA
NEW ENGLAND							
VERMONT							
VERMONT GAS SYSTEMS	BURLINGTON	5.79	6.83	23.74	11.79	ELECTRIC	573.00
NEW ENGLAND DIVISION		7.11	5.56	26.40	11.19		733.51

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31 NATURAL GAS	FUEL OIL NO. 2	ELECTRIC	PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL($)
MIDDLE ATLANTIC NEW JERSEY							
SOUTH JERSEY GAS CO.	ATLANTIC CITY	6.66	7.53	30.22	10.26	ELECTRIC	427.00
NEW JERSEY NATURAL GAS CO.	ASBURY PARK	6.01	7.47	26.82	12.00	#2 OIL	565.07
ELIZABETHTOWN GAS CO.	ELIZABETH	6.46	8.09	29.31	10.59	#2 OIL	846.00
PUBLIC SERVICE ELEC. & GAS	NEWARK	6.51	7.55	20.98	NA	#2 OIL	730.00
MIDDLE ATLANTIC NEW YORK							
BROOKLYN UNION GAS CO.	NEW YORK	6.13	8.70	25.50	NA	#2 OIL	724.00
CENTRAL HUDSON GAS & ELEC.	POUGHKEEPSIE	6.54	8.20	29.51	11.14	#2 OIL	446.00
CONSOLIDATED EDISON OF NY	NEW YORK	7.14	8.46	38.71	NA	#2 OIL	875.00
NATIONAL FUEL GAS DISTR.	BUFFALO	5.85	8.27	20.93	10.81	#2 OIL	562.07
LONG ISLAND LIGHTING CO.	LONG BEACH	6.87	8.85	25.64	11.24	#2 OIL	734.00
NEW YORK STATE ELEC. & GAS	ITHACA	6.50	7.48	23.45	11.24	#2 OIL	890.00
ROCHESTER GAS & ELECTRIC	ROCHESTER	5.39	8.34	19.64	10.80	ELECTRIC	533.00
COLUMBIA GAS OF NEW YORK	BINGHAMTON	5.73	7.15	25.38	11.14	#2 OIL	400.00
ST. LAWRENCE GAS CO.	MASSENA	5.43	7.12	14.07	11.46	ELECTRIC	605.37
MIDDLE ATLANTIC PENNSYLVANIA							
NATIONAL FUEL GAS DISTR.	ERIE	5.24	7.68	22.96	10.81	#2 OIL	517.33
NORTH PENN GAS CO.	RURAL	5.74	5.36	24.03	10.81	#2 OIL	407.62
THE PEOPLES NATURAL GAS CO.	PITTSBURGH	5.90	7.14	19.05	11.79	ELECTRIC	521.00
PHILADELPHIA ELECTRIC CO.	PHILADELPHIA	7.34	7.91	17.36	9.83	ELECTRIC	804.00
PHILADELPHIA GAS WORKS	PHILADELPHIA	7.11	8.27	18.41	16.49		796.00
PENNSYLVANIA GAS & WATER	WILKES-BARRE	6.40	5.16	24.62	12.01	#2 OIL	645.00
UGI CORPORATION	READING	6.46	7.73	20.56	10.92	#2 OIL	555.00
COLUMBIA GAS OF PENNSYLVANIA	PITTSBURGH	5.66	7.12	20.02	10.37	ELECTRIC	400.00
MIDDLE ATLANTIC DIVISION		6.49	7.60	23.67	11.32		653.55

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31 NATURAL GAS	FUEL OIL NO. 2	ELECTRIC	PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL($)
EAST NORTH CENTRAL ILLINOIS							
CENTRAL ILLINOIS LIGHT CO.	PEORIA	5.12	6.83	14.32	7.75	ELECTRIC	600.00
CENTRAL IL PUBLIC SERVICE	QUINCY	5.27	6.55	15.45	7.66	ELECTRIC	511.00
ILLINOIS POWER CO.	DECATUR	5.11	6.94	11.14	6.03	ELECTRIC	540.25
IOWA-ILLINOIS GAS & ELEC.	ROCK ISLAND	4.70	5.32	17.01	6.11	PROPANE	542.00
NORTH SHORE GAS CO.	WAUKEGAN	4.64	7.77	12.90	NA	ELECTRIC	771.00
PEOPLES GAS LIGHT & COKE	CHICAGO	4.56	7.77	12.86	NA	ELECTRIC	779.00
NORTHERN ILLINOIS GAS CO.	ROCKFORD	4.03	5.96	13.51	8.85	ELECTRIC	562.00
UNITED CITIES GAS CO.	VANDALIA	6.00	6.83	20.52	8.73	ELECTRIC	400.00
EAST NORTH CENTRAL INDIANA							
CITIZENS GAS & COKE	INDIANAPOLIS	4.90	6.06	10.55	8.52	ELECTRIC	475.00
HOOSIER GAS CORP.	VINCENNES	4.96	5.11	19.05	9.49	ELECTRIC	516.12
INDIANA GAS CO.	CLARKSVILLE	6.29	7.27	18.55	8.41	ELECTRIC	589.00
KOKOMO GAS & FUEL CO.	KOKOMO	5.50	6.47	14.65	8.62	ELECTRIC	475.00
LAWRENCEBURG GAS CO.	LAWRENCEBURG	5.63	7.77	NA	9.33	ELECTRIC	636.00
NORTHERN IN PUBLIC SERVICE	FORT WAYNE	4.39	7.55	19.75	8.98	ELECTRIC	470.00
OHIO VALLEY GAS CORP.	WINCHESTER	5.29	5.40	20.52	7.64	ELECTRIC	561.00
SOUTHERN IN GAS & ELECTRIC	EVANSVILLE	4.74	6.62	15.93	8.62	#2 OIL	506.00
EAST NORTH CENTRAL MICHIGAN							
BATTLE CREEK GAS CO.	BATTLE CREEK	5.60	6.11	19.78	9.61	#2 OIL	589.12
CONSUMERS POWER CO.	FLINT	6.21	7.57	15.17	9.73	#2 OIL	690.00
LAKE SUPERIOR DIST. POWER	IRONWOOD	5.73	7.41	15.50	9.06	ELECTRIC	640.00
MICHIGAN CONSOLIDATED GAS	DETROIT	5.73	7.69	26.41	10.38	#2 OIL	593.00
MICHIGAN POWER CO.	HOLLAND	5.07	7.09	14.95	9.33	#2 OIL	494.92
MICHIGAN GAS UTILITIES CO.	MONROE	5.31	6.33	26.29	9.83	#2 OIL	531.00
WISCONSIN PUBLIC SERVICE	MENOMINEE	5.54	7.03	19.64	9.46	#2 OIL	543.82
EAST NORTH CENTRAL OHIO							

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31 NATURAL GAS	FUEL OIL NO. 2	ELECTRIC	PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL($)
CINCINNATI GAS & ELECTRIC	CINCINNATI	5.32	7.77	14.40	9.33	ELECTRIC	537.00
DAYTON POWER & LIGHT CO.	DAYTON	5.36	6.26	16.46	10.70	#2 OIL	403.00
EAST OHIO GAS CO.	CLEVELAND	5.47	8.38	15.41	10.26	ELECTRIC	632.00
NATIONAL GAS & OIL CORP.	NEWARK	5.14	7.64	22.42	9.83	#2 OIL	345.00
NATIONAL FUEL GAS DISTR.	ANDOVER	5.24	7.65	22.86	10.51	#2 OIL	521.81
OHIO GAS CO.	BRYAN	6.12	7.12	20.52	6.73	ELECTRIC	739.00
WEST OHIO GAS CO.	LIMA	5.71	7.47	20.22	10.69	ELECTRIC	554.34
COLUMBIA GAS OF OHIO	COLUMBUS	5.97	7.49	17.67	9.33	ELECTRIC	415.00
EAST NORTH CENTRAL WISCONSIN							
LAKE SUPERIOR DIST. POWER	ASHLAND	5.15	7.55	17.47	9.28	ELECTRIC	536.00
MADISON GAS & ELECTRIC CO.	MADISON	5.14	7.55	18.55	6.41	#2 OIL	564.00
WISCONSIN GAS CO.	MILWAUKEE	6.06	7.09	19.72	6.35	#2 OIL	642.00
NORTHERN STATES POWER CO.	EAU CLAIRE	6.03	7.70	16.01	6.62	ELECTRIC	504.00
WISCONSIN FUEL & LIGHT CO.	WAUSAU	5.36	7.63	17.61	6.95	#2 OIL	573.44
WISCONSIN PUBLIC SERVICE	GREEN BAY	5.54	7.03	19.64	9.46	#2 OIL	543.82
WISCONSIN SOUTHERN GAS CO.	LAKE GENEVA	5.30	6.93	19.64	5.52	ELECTRIC	463.00
WISCONSIN NATURAL GAS CO.	RACINE	5.90	7.34	19.72	6.13	#2 OIL	631.49
EAST NORTH CENTRAL DIVISION		5.33	7.13	17.91	9.05		582.60
WEST NORTH CENTRAL IOWA							
CEDAR FALLS UTILITIES	CEDAR FALLS	5.27	6.47	11.72	6.55	PROPANE	500.00
IOWA ELECTRIC LIGHT & POWER	MUSCATINE	4.31	4.96	17.44	5.99	#2 OIL	450.00
IOWA-ILLINOIS GAS & ELECTRIC	DAVENPORT	4.45	5.32	17.24	6.11	PROPANE	491.00
IOWA GAS CO.	DES MOINES	5.06	2.60	22.01	3.01	ELECTRIC	475.00
IOWA PUBLIC SERVICE CO.	SIOUX CITY	5.14	7.49	19.78	6.55	PROPANE	613.52
NORTH CENTRAL PUBLIC SERVICE	FORT MADISON	5.39	5.56	17.58	5.42	ELECTRIC	480.00
WEST NORTH CENTRAL KANSAS							

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31 NATURAL GAS	 FUEL OIL NO. 2	 ELECTRIC	 PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL($)
ARKANSAS LOUISIANA GAS CO.	WICHITA	3.09	5.33	19.05	7.42	ELECTRIC	247.00
MIDWEST ENERGY, INC.	HAYS	3.41	NA	17.44	6.33	ELECTRIC	426.19
KPL GAS SERVICE	TOPEKA	3.50	5.97	17.00	5.99	ELECTRIC	315.00
KN ENERGY, INC.	COLBY	3.33	NA	21.95	5.35	ELECTRIC	293.00
WEST NORTH CENTRAL MINNESOTA							
AUSTIN UTILITIES	AUSTIN	4.79	5.11	19.05	5.90	PROPANE	480.00
CITY OF DULUTH	DULUTH	5.71	5.76	17.00	9.28	#2 OIL	800.00
NORTHERN STATES POWER CO.	ST. PAUL	5.96	5.66	15.12	8.12	ELECTRIC	685.00
NORTH CENTRAL PUBLIC SERVICE	COON RAPIDS	4.95	4.10	23.15	7.26	ELECTRIC	700.00
MINNEGASCO, INC.	MINNEAPOLIS	5.27	7.55	15.93	6.41	ELECTRIC	688.00
WEST NORTH CENTRAL MISSOURI							
KPL GAS SERVICE	KANSAS CITY	3.50	3.24	17.00	6.64	ELECTRIC	315.[illegible]0
LACLEDE GAS CO.	ST. LOUIS	4.87	7.55	10.67	6.08	ELECTRIC	459.[illegible]
CITY OF SPRINGFIELD	SPRINGFIELD	3.98	6.61	14.87	7.41	ELECTRIC	292.[illegible]
ASSOCIATED NATURAL GAS CO.	SIKESTON	4.81	7.19	20.75	7.77	PROPANE	491[illegible]0
WEST NORTH CENTRAL NEBRASKA							
HASTINGS UTILITIES	HASTINGS	4.23	NA	20.52	NA	NA	544.08
IOWA PUBLIC SERVICE CO.	SIOUX CITY	5.16	7.48	NA	6.55	PROPANE	574.26
KN ENERGY, INC.	SCOTTSBLUFF	4.19	NA	14.36	5.66	ELECTRIC	343.00
METROPOLITAN UTILITIES DIST.	OMAHA	4.33	6.83	10.73	7.31	ELECTRIC	394.00
NORTHWESTERN PUBLIC SERVICE	GRAND ISLAND	4.13	7.19	9.79	7.31	ELECTRIC	443.00
MINNEGASCO, INC.	LINCOLN	5.12	7.55	13.77	8.73	ELECTRIC	376.00
WEST NORTH CENTRAL NORTH DAKOTA							
MONTANA-DAKOTA UTILITIES CO.	BISMARCK	4.30	9.06	15.65	7.75	ELECTRIC	533.00
NORTHERN STATES POWER CO.	FARGO	4.90	5.65	11.61	9.17	ELECTRIC	563.00

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31 NATURAL GAS	FUEL OIL NO. 2	ELECTRIC	PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL($)
WEST NORTH CENTRAL SOUTH DAKOTA							
IOWA PUBLIC SERVICE CO.	YANKTON	5.26	7.48	15.53	6.55	PROPANE	617.22
MONTANA-DAKOTA UTILITIES CO.	RAPID CITY	6.15	5.67	12.95	7.63	ELECTRIC	450.00
NORTHWESTERN PUBLIC SERVICE	ABERDEEN	5.15	7.26	9.82	7.21	ELECTRIC	533.00
MINNEGASCO, INC.	SIOUX FALLS	5.26	7.63	15.93	8.54	ELECTRIC	468.00
WEST NORTH CENTRAL DIVISION		4.56	6.22	16.15	7.05		462.94
SOUTH ATLANTIC DISTRICT OF COLUMBIA							
WASHINGTON GAS LIGHT CO.	WASHINGTON	6.95	8.84	17.41	13.53	ELECTRIC	547.91
SOUTH ATLANTIC DELAWARE							
DELMARVA POWER & LIGHT CO.	WILMINGTON	6.22	6.91	17.58	10.37	#2 OIL	NA
SOUTH ATLANTIC FLORIDA							
PEOPLES GAS SYSTEM, INC.	MIAMI	6.07	6.40	26.08	10.70	ELECTRIC	125.00
SOUTH ATLANTIC GEORGIA							
ATLANTA GAS LIGHT CO.	ATLANTA	5.42	7.19	16.71	9.72	ELECTRIC	315.00
UNITED CITIES GAS CO.	COLUMBUS	6.09	7.09	19.05	6.73	ELECTRIC	324.00
SOUTH ATLANTIC MARYLAND							

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31 NATURAL GAS	FUEL OIL NO. 2	ELECTRIC	PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL($)
BALTIMORE GAS & ELECTRIC	BALTIMORE	6.52	8.27	18.55	9.17	ELECTRIC	465.00
WASHINGTON GAS LIGHT CO.	HYATTSVILLE	6.04	8.84	15.01	13.53	ELECTRIC	564.00
COLUMBIA GAS OF MARYLAND	CUMBERLAND	5.47	7.59	16.59	11.57	ELECTRIC	450.00
SOUTH ATLANTIC NORTH CAROLINA							
PIEDMONT NATURAL GAS CO.	CHARLOTTE	6.51	7.91	16.17	10.31	ELECTRIC	485.00
PUBLIC SERVICE OF NC	RALEIGH	5.88	7.84	21.69	9.50	ELECTRIC	464.00
CITY OF WILSON	WILSON	5.95	7.20	20.89	10.93	#2 OIL	446.61
NORTH CAROLINA NATURAL GAS	FAYETTEVILLE	5.40	7.55	90.50	9.83	ELECTRIC	322.00
SOUTH ATLANTIC SOUTH CAROLINA							
PIEDMONT NATURAL GAS CO.	GREENVILLE	6.13	7.91	17.00	10.59	ELECTRIC	434.00
SOUTH CAROLINA ELEC. & GAS	COLUMBIA	6.10	5.76	18.32	9.83	#2 OIL	353.00
UNITED CITIES GAS CO.	GAFFNEY	6.20	6.53	16.12	8.73	ELECTRIC	300.00
SOUTH ATLANTIC VIRGINIA							
CITY OF CHARLOTTESVILLE	CHARLOTTESVILLE	5.96	5.11	16.71	10.15	ELECTRIC	600.00
CITY OF DANVILLE	DANVILLE	5.19	8.32	12.10	9.61	ELECTRIC	294.50
CITY OF RICHMOND	RICHMOND	6.70	7.27	19.05	10.70	ELECTRIC	309.00
ROANOKE GAS CO.	ROANOKE	5.70	7.27	20.52	8.95	ELECTRIC	497.90
UNITED CITIES GAS CO.	BRISTOL	5.50	6.83	14.65	8.73	ELECTRIC	450.00
COLUMBIA GAS OF VIRGINIA	STAUNTON	5.92	7.91	21.64	11.09	ELECTRIC	415.00
WASHINGTON GAS LIGHT CO.	ALEXANDRIA	6.22	8.84	14.71	13.53	ELECTRIC	428.00
1							
SOUTH ATLANTIC WEST VIRGINIA							
HOPE NATURAL GAS CO.	PARKERSBURG	6.17	5.53	17.92	9.61	ELECTRIC	473.24
SOUTH ATLANTIC DIVISION		5.97	7.40	21.17	10.65		400.11

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31				PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL($)
		NATURAL GAS	FUEL OIL NO. 2	ELECTRIC	PROPANE		
EAST SOUTH CENTRAL							
ALABAMA							
ALABAMA GAS CORP.	BIRMINGHAM	5.92	6.07	16.56	5.96	ELECTRIC	499.56
CITY OF HUNTSVILLE	HUNTSVILLE	5.38	4.99	13.30	9.72	ELECTRIC	550.00
DECATUR UTILITIES	DECATUR	4.38	NA	13.03	6.17	ELECTRIC	217.00
CITY OF FLORENCE	FLORENCE	5.59	6.24	17.88	9.29	ELECTRIC	NA
SOUTHEAST ALABAMA GAS DIST.	ANDALUSIA	5.60	7.19	10.26	9.25	ELECTRIC	350.00
EAST SOUTH CENTRAL							
KENTUCKY							
COLUMBIA GAS OF KENTUCKY	LEXINGTON	5.67	6.69	14.65	11.03	ELECTRIC	400.00
LOUISVILLE GAS & ELECTRIC	LOUISVILLE	4.60	7.40	13.87	9.17	ELECTRIC	308.33
UNION LIGHT, HEAT & POWER	COVINGTON	5.82	7.77	13.75	9.63	ELECTRIC	625.00
WESTERN KENTUCKY GAS CO.	OWENSBORO	4.26	6.33	15.53	9.06	ELECTRIC	263.00
DELTA NATURAL GAS CO.	WINCHESTER	5.48	6.47	16.12	9.83	ELECTRIC	350.00
EAST SOUTH CENTRAL							
MISSISSIPPI							
ENTEX, INC.	GULFPORT	5.43	NA	22.80	7.71	ELECTRIC	205.20
EAST SOUTH CENTRAL							
TENNESSEE							
MEMPHIS LIGHT, GAS & WATER	MEMPHIS	5.00	5.04	14.65	8.52	PROPANE	405.00
NASHVILLE GAS CO.	NASHVILLE	5.30	5.76	14.36	9.28	ELECTRIC	345.00
UNITED CITIES GAS CO.	COLUMBIA	5.60	6.93	14.65	8.73	ELECTRIC	330.00
MIDDLE TENNESSEE NATURAL GAS	SMITHVILLE	5.88	6.40	NA	9.81	ELECTRIC	364.00
JACKSON UTILITY DIVISION	JACKSON	4.59	6.20	14.26	9.83	ELECTRIC	295.64
EAST SOUTH CENTRAL DIVISION		5.26	6.27	15.05	9.38		391.56

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	NATURAL GAS	FUEL OIL NO. 2	ELECTRIC	PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL(S)
		ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31					
WEST SOUTH CENTRAL ARKANSAS							
ARKANSAS LOUISIANA GAS CO.	LITTLE ROCK	4.26	NA	21.98	9.23	ELECTRIC	223.00
ARKANSAS WESTERN GAS CO.	FAYETTEVILLE	3.92	NA	20.34	6.19	ELECTRIC	213.19
ARKANSAS OKLAHOMA GAS CORP.	FORT SMITH	3.70	NA	29.60	7.36	ELECTRIC	318.56
ASSOCIATED NATURAL GAS CO.	BLYTHEVILLE	4.27	7.55	20.75	8.52	PROPANE	431.00
WEST SOUTH CENTRAL LOUISIANA							
ARKANSAS LOUISIANA GAS CO.	SHREVEPORT	4.03	2.37	13.64	7.64	ELECTRIC	227.00
NEW ORLEANS PUBLIC SERVICE	NEW ORLEANS	6.73	NA	17.76	NA	ELECTRIC	NA
ENTEX, INC.	LAKE CHARLES	5.50	NA	24.30	7.71	ELECTRIC	181.63
WEST SOUTH CENTRAL OKLAHOMA							
ARKANSAS LOUISIANA GAS CO.	LAWTON	4.68	3.67	19.05	6.00	ELECTRIC	249.00
ARKANSAS OKLAHOMA GAS CORP.	POTEAU	4.90	NA	17.26	7.86	ELECTRIC	366.46
KPL GAS SERVICE	BARTLESVILLE	3.50	3.17	17.00	6.34	ELECTRIC	315.00
LONE STAR GAS CO.	DURANT	5.04	NA	20.52	8.84	ELECTRIC	275.00
OKLAHOMA NATURAL GAS CO.	OKLAHOMA CITY	3.95	NA	12.90	9.38	ELECTRIC	291.98
WEST SOUTH CENTRAL TEXAS							
ARKANSAS LOUISIANA GAS CO.	TEXARKANA	4.67	5.11	19.93	9.39	ELECTRIC	209.00
LONE STAR GAS CO.	DALLAS	5.10	NA	19.40	8.64	ELECTRIC	310.00
CITY PUBLIC SERVICE	SAN ANTONIO	5.37	NA	17.53	5.19	ELECTRIC	157.45
ENTEX, INC.	HOUSTON	5.50	NA	25.64	7.71	ELECTRIC	131.48
WEST SOUTH CENTRAL DIVISION		4.95	4.37	20.16	8.15		245.89

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31 NATURAL GAS	 FUEL OIL NO. 2	 ELECTRIC	 PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL($)
MOUNTAIN ARIZONA							
CITIZENS UTILITIES CO.	NOGALES	7.21	NA	26.52	10.37	PROPANE	243.00
SOUTHWEST GAS CORP.	TUCSON	5.71	3.69	16.23	9.63	ELECTRIC	219.00
MOUNTAIN COLORADO							
CITY OF COLORADO SPRINGS	COLORADO SPRINGS	5.19	NA	12.43	NA	ELECTRIC	362.00
KN ENERGY, INC.	YUMA	5.36	NA	20.63	6.00	ELECTRIC	429.00
PUBLIC SERVICE OF COLORADO	DENVER	4.26	5.11	25.27	7.10	ELECTRIC	367.09
MOUNTAIN IDAHO							
WASHINGTON WATER POWER	LEWISTON	5.00	6.11	13.34	5.19	#2 OIL	NA
INTERMOUNTAIN GAS CO.	BOISE	6.23	4.67	12.14	10.91	ELECTRIC	400.00
MOUNTAIN MONTANA							
GREAT FALLS GAS CO.	GREAT FALLS	4.33	4.46	13.54	7.86	ELECTRIC	384.00
MONTANA-DAKOTA UTILITIES CO.	BILLINGS	5.45	6.50	14.13	8.09	ELECTRIC	460.00
MONTANA POWER CO.	MISSOULA	3.83	6.61	14.43	8.61	ELECTRIC	393.00
MOUNTAIN NEW MEXICO							
GAS CO. OF NEW MEXICO	ALBUQUERQUE	5.79	NA	26.35	6.62	ELECTRIC	267.86
MOUNTAIN NEVADA							
SIERRA PACIFIC POWER CO.	RENO	6.75	7.55	25.79	12.35	#2 OIL	447.92
SOUTHWEST GAS CORP.	LAS VEGAS	5.22	6.38	19.56	12.25	ELECTRIC	284.00

DIVISION STATE COMPANY	PRINCIPAL CITY SERVED	ALL PRICES IN DOLLARS PER MILLION BTU AS OF DECEMBER 31 NATURAL GAS	FUEL OIL NO. 2	ELECTRIC	PROPANE	PRINCIPAL COMPETITIVE FUEL	AVERAGE ANNUAL GAS HTG BILL($)
MOUNTAIN							
WYOMING							
KN ENERGY, INC.	DOUGLAS	4.91	NA	17.43	7.10	ELECTRIC	384.00
MONTANA-DAKOTA UTILITIES CO.	SHERIDAN	5.77	7.55	15.65	7.97	ELECTRIC	326.00
WYOMING GAS CO.	WORLAND	4.11	7.34	16.63	7.64	ELECTRIC	559.00
NORTHERN GAS DIVISION	CASPER	4.41	NA	13.72	7.31	ELECTRIC	469.00
MOUNTAIN DIVISION		5.07	6.20	17.61	6.79		326.47
PACIFIC							
CALIFORNIA							
CITY OF LONG BEACH	LONG BEACH	3.61	NA	NA	NA	ELECTRIC	231.00
PACIFIC GAS & ELECTRIC CO.	SAN FRANCISCO	5.01	5.77	22.57	5.25	#2 OIL	203.00
SAN DIEGO GAS & ELECTRIC	SAN DIEGO	4.00	NA	30.55	11.45	ELECTRIC	134.00
SOUTHWEST GAS CORP.	VICTORVILLE	6.75	5.92	19.35	13.92	PROPANE	310.96
SOUTHERN CALIFORNIA GAS CO.	LOS ANGELES	6.00	NA	23.13	7.02	ELECTRIC	196.00
PACIFIC							
OREGON							
NORTHWEST NATURAL GAS CO.	PORTLAND	6.53	7.62	14.07	8.73	ELECTRIC	415.50
PACIFIC							
WASHINGTON							
NORTHWEST NATURAL GAS CO.	VANCOUVER	5.37	7.62	10.54	6.73	ELECTRIC	347.90
WASHINGTON WATER POWER	SPOKANE	4.96	6.11	12.31	6.19	#2 OIL	265.00
WASHINGTON NATURAL GAS CO.	SEATTLE	5.47	5.90	15.23	NA	ELECTRIC	535.00
PACIFIC DIVISION		5.63	6.16	16.47	6.61		231.71

Senator EVANS. Thank you.
Mr. Wiel.

STATEMENT OF STEPHEN WIEL, COMMISSIONER, PUBLIC SERVICE COMMISSION OF NEVADA, ON BEHALF OF THE NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS

Mr. WIEL. Thank you, Mr. Chairman. I am Steve Wiel, Nevada Public Service Commissioner and chairman of the Energy Conservation Committee of the National Association of Regulatory Utility Commissioners. NARUC is an organization comprised of 200-plus utility commissioners across the county in all 50 States. I am speaking today on behalf of NARUC. What I would like to do is give you a viewpoint from the States.

My written testimony focuses, as an example, on one utility and its customers: Nevada Power Co., and the people in Las Vegas. I am most familiar with that company. But I believe that the points I am going to make today and that I make in my written testimony could be made using any of the roughly 3,000 electric utility companies in the country.

One of the main points I wish to make today is that utility companies are scrambling right now to avoid building new powerplants. And the example I use in my written testimony, I show that the cost of new power for the Nevada Power Co., is significantly higher than the cost of old power. This is the existing power. This is true for most utility companies. Therefore, having to build new powerplants affects consumers across the country, virtually all consumers.

My testimony describes two of about three dozen measures that Nevada Power Co., is taking to try to avoid building these new powerplants. The first one is appliance rebates. And the example I give in the testimony shows that Nevada Power, like utility companies in over half the States, are providing rebates for people; they are paying people to not buy the least-efficient appliances on the market. The reason I make that point is to show that the free market is not providing the economically efficient result that many people like to think it is.

The second measure that I'd like to point out to you that Nevada Power is considering in its long-run plans are State appliance standards. In fact, legislation is now being prepared in Nevada for submittal in the next legislative session this coming spring. And as you have heard from other people, ours, too, would likely differ from legislation in other States.

Our legislators in the past have shown somewhat of an independence. And if we did have different standards, we in the State would be saddled with the burden of monitoring imports of appliances. This is a typical situation in other States. California, Kansas, Maine, New Jersey, New York are States that I'm aware of that already have statewide appliance standards. As you know, the building codes differ greatly in differing States, and there is a variety there, too.

I am also aware of legislation that either has been introduced or is planned for introduction in the near future in at least a dozen other States, including Nevada.

Now we in Nevada would strongly prefer a uniform national standard. And I will point out to you in a minute that I believe that is a uniform consensus within NARUC. There are many reasons why we would prefer a uniform national standard. You have heard some of them already today. It would relieve us of a significant administrative burden within the State. I could list for you some pros and cons of why the Federal administrative burden might be more or less than ours. But from our point of view, it would be a tremendous relief for us to have national standards.

It would avoid, as you have heard earlier, the threat of a black market in our State, where we would have to worry about shipments of appliances which violate our standards into the State.

It would avoid I think what might be an increased cost of appliances. The manufacturers, as they have testified earlier, would likely have to charge more for custom appliances that are tailored to our State than they would if they took advantages of national economies of scale.

And, quite frankly, I think even if we in Nevada didn't pass legislation this coming spring, in the long run we would be forced into it anyway because we become the dumping grounds of our neighboring States that were passing such legislation and that would result in unnecessarily high bills to people in Nevada, and we would want to avoid that.

It is unfortunate to me that legislation is needed at all, Federal or State. Clearly to me, there has been a gross failure in the marketplace to achieve rational economic investment. My written testimony lists a number of reasons for this. You have heard some today. Third-party purchasers is one, some of the practices of manufacturers is another, a study to be published shortly by three people from Lawrence Berkeley Laboratories which goes into a much more detailed study demonstrating the failure of this marketplace. But I believe it is there.

And whatever the reasons may be for this market failure, it threatens to cost us in Nevada perhaps $100 million and to cost people, as you have heard today, across the country billions of dollars over the next two decades.

And my fellow commissioners in general agree with me at NARUC's summer meeting this past July, the Energy Conservation Committee sponsored a resolution, which I have attached to my written testimony; the executive committee adopted it with a strong statement in support of national appliance standards. And these were passed unanimously both by my committee and the executive committee.

It is significant when NARUC supports mandatory Federal standard. Neither I nor my fellow commissioners anywhere in the country take preemption of any State's rights lightly. But we feel S. 2781 contains a fair balance between States and State's rights and the Federal need. There is a procedure and criteria for States to increase the standards in the future. There is a procedure and criteria for States adopting more stringent standards in the future. The appliance industry has time to adapt, and I think that this legislation is fair to all parties.

Efficient appliances help keep people's monthly utilities low and in the long run helps avoid the need to spend billions of dollars to meet growing demand for gas and electricity.

Inefficient appliances victimize those least able to afford high monthly bills—people with low income; people on fixed income. S. 2781 will make lower cost energy available to customers in all income brackets.

I also sympathize with the philosophical statement and position taken by the U.S. Department of Energy. Under normal circumstances, I, too, would prefer the free market to operate. But as you have heard, the choice isn't between a free market and Federal standards; the real choice is between the patchwork of State standards referred to and the Federal standards. And even if the patchwork of State standards weren't there, I submit that the free market really isn't providing the efficiency that others are claiming. And the billions of dollars that have been referred to, I believe, are much too high a price to pay for the luxury of that philosophical statement.

NARUC fully supports S. 2781 and we urge you to pass this bill without delay.

Thank you very much.

[The prepared statement of Mr. Wiel follows:]

UNITED STATES SENATE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION

STATEMENT OF THE

NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS
1102 INTERSTATE COMMERCE COMMISSION BUILDING
TWELFTH STREET AND CONSTITUTION AVENUE, N.W.
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ON

S. 2781, A BILL PROPOSING THE
NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

SEPTEMBER 16, 1986

1889

STATEMENT OF

STEPHEN WIEL
Commissioner, Public Service Commission of Nevada
and
Chairman, Committee on Energy Conservation
National Association of Regulatory Utility Commissioners

BEFORE THE

SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION
SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

On behalf of the State of Nevada's Public Service Commission and the National Association of Regulatory Utility Commissioners, I thank the subcommittee for the opportunity to testify on an issue of significant concern - S. 2781, the National Appliance Energy Conservation Act of 1986.

I am Stephen Wiel, a Nevada Public Service Commissioner and a member of the National Association of Regulatory Utility Commissioners (N.A.R.U.C.). The Association is a quasi-governmental nonprofit organization composed of governmental agencies engaged in the regulation of public utilities and carriers. The Association has been used by the Federal Government for 97 years as a key instrument to maintain and strengthen Federal-State cooperation in this regulation. I am chairman of N.A.R.U.C.'s Energy Conservation Committee and am speaking today on behalf of the Association.

N.A.R.U.C believes this country's future demand for electricity should be provided in the most efficient way possible. The sale of inefficient appliances runs counter to the goal of achieving least-cost investment for satisfying the nation's increasing appetite for electricity. Efficient appliances help keep people's monthly utility bills low and, in the long term, help avoid the need to spend billions of dollars to meet the growing demand for electricity and gas. Enactment of S. 2781 would greatly assist state regulatory commissions and utility companies to provide the most energy services for the lowest possible price.

You were presented a national perspective of the benefits of S. 2781 by the earlier panelists this morning. I would like to shift your focus now to the state level. Let's start with the perspective of one utility company and its customers -- Nevada Power Company and the people in Las Vegas. I am most familiar with this company although I expect I could make my point using the experiences of almost any of the roughly 3000 electric utility companies in the United States.

1. UTILITY COMPANIES ARE SEEKING WAYS TO AVOID BUILDING NEW POWER PLANTS

My fellow commissioners and I spent eight days in hearings in Las Vegas during the past two weeks reviewing Nevada Power Company's 20 year resource plan. Nevada Power expects to have to build or buy 11 new power plants during the next 20 years. That's half as many as they already have. Nevada Power expects it will have to pay $925 million for these new plants. Thats nearly $1,000 per kilowatt in 1986 dollars. Its books show an original cost of about $300 per kilowatt for its current plants. The company's cost for new power is, thus, three times its existing cost. This is virtually the only reason why the company predicts its rate to increase over this 20 year period.

As you might expect, our hearing room was filled to capacity. Besides our own technical staff and the company's executives and staff, there were representatives from the State Consumer Advocate's Office, the State Office of Community Services, White Pine County, Southwest Gas Corporation, Sierra Pacific Power Company and various consumer groups. All, including the company, were advocating ways to avoid having to build so many new power plants. This situation is happening in utility companies across the country. Over the next decade it will affect almost all consumers. I am going to mention today only two of the roughly three dozen measures proposed to alleviate Nevada Power's projected capital spending requirements: (1) appliance rebates and (2) state appliance energy conservation standards.

2. UTILITY COMPANIES ARE PAYING PEOPLE TO NOT BUY INEFFICIENT APPLIANCES

One key element of Nevada Power's 20 year resource plan has Nevada Power paying contractors and customers cash rebates for purchasing efficient appliances. The company, for example, last year paid the builders of several thousand homes an average of $185 per home to install heat pumps with higher than average efficiencies.

Utility companies in over half the states pay rebates to builders and homeowners in order to keep them from installing inefficient appliances.[1] Surely, it is economically inefficient to pay people to not buy goods that have already been manufactured. It either causes waste or shifts the diseconomy onto someone else.

3. STATES ARE ENACTING APPLIANCE STANDARDS

State appliance standards were also proposed as a key element for Nevada Power's resource plan. A recent study of the potential impact of appliance standards at Nevada Power Company supports this proposal. The study was conducted by Lawrence Berkeley Laboratory under the sponsorship of the U.S. Department of Energy[2]. The study analyzes three sets of appliance standards for Nevada Power which bracket the basic federal standards proposed for initial implementation in S. 2781. The study concludes that appliance standards could cost-effectively reduce Nevada Power's residential need for new power plants by 30 to 60 percent.

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[1] R.P. Blevins. 1985 Survey of Utility Residential End-Use Projects. Electric Power Research Institute, EPRI EM-4578, May 1986, (plus personal communications).

[2] E. Kahn, J. Eto, J. Koomey, J. E. McMahon, P. Chan, M. D. Levine. "Valuation of Demand Side Utility Programs." Proceedings of the American Council for an Energy Efficient Economy, 1986, Summer Study or Energy Efficiency in Buildings. pp. 8.147 to 8.160.

The Nevada Office of Community Services is currently proposing legislation for introduction to the Nevada Legislature next spring which would largely mirror California's appliance standards. Our state legislature will likely enact comprehensive appliance standards by June, 1987. No one can say for sure what form they will take, but, judging from past displays of independence by Nevada legislators, it is likely that our standards would differ at least slightly from those of our neighbors. We then would be saddled with the burden of monitoring appliances imported to Nevada to ensure they meet our particular standards.

The situation in Nevada is typical of that found in other states. California, Kansas, Maine, New Jersey and New York already have enacted appliance standards. Legislation has been introduced or is planned for introduction in at least a dozen other states.

4. N.A.R.U.C. SUPPORTS NATIONAL APPLIANCE STANDARDS

We in Nevada would prefer a uniform national standard. It would relieve us of a huge administrative burden and avoid the threat of black market imports of inefficient appliances into the state. It would avoid increases in appliance costs resulting from limited production runs by manufacturers and from the administrative burden on manufacturers to satisfy our unique requirements. Without federal standards, we would be forced over time to adopt our own standards even if we didn't do it next year. Those states that don't create and enforce appliance standards will become dumping grounds for inefficient appliances. This will mean unnecessarily high utility bills for people in those states.

It is unfortunate that legislation is needed at all, at the federal level or at the state level. But clearly there has been a gross failure in the marketplace to achieve rational economic investment.[3] The failure, I believe, largely results from purchases by persons other than the users of the appliances. These third party purchasers have little, if any, vested interest in the operating costs of the appliances they buy. The problem is further exacerbated by the pricing practices of manufacturers, the financing practices of banks and other lenders, the business practices of appliance contractors, the sales practices of realtors, and the buying habits of the public. Whatever the reasons may be, this market failure threatens to cost us in Nevada perhaps a hundred million dollars and to cost people across the country billions of dollars over the next two decades.

My fellow Commissioners in other states are in a similar situation and feel the same as I do. They too would prefer a uniform national standard as they have demonstrated. At N.A.R.U.C.'s summer convention this year, the attached resolution supporting national appliance standards was sponsored by the Committee on Energy Conservation and adopted by the Executive Committee. The vote by both groups was unanimous.

5. N.A.R.U.C. SUPPORTS S. 2781, THE NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

It is a significant event when N.A.R.U.C. supports a mandatory federal standard. Neither I nor my fellow Commissioners take preemption of any states' rights lightly. We stated this clearly in the final paragraph of our July 31 N.A.R.U.C. resolution.

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[3] H. Ruderman, M. D. Levine & J. E. McMahon, "The Behavior of the Market for Energy Efficiency in Residential Appliances including Heating and Cooling Equipment." The Energy Journal, Winter 1986.

S. 2781 contains a fair balance of federal and states rights. It allows existing state standards to remain in place until the federal standards become effective. It provides a procedure and criteria for states to raise the federal standard or adopt more stringent state standards in the future. It allows the appliance industry time to adapt to the initial federal standard and any subsequent federal or state standards.

Inefficient appliances victimize those least able to afford high monthly utility bills. People with low income and people on fixed incomes are affected the most. S. 2781 will make lower cost energy available to customers in all income brackets.

N.A.R.U.C. offers its full support of S. 2781 and urges Congress to pass this bill without delay.

Resolution On Appliance Standards

WHEREAS, a National Appliance Energy Conservation Act will provide very significant energy savings through substantially improved appliance efficiency; and

WHEREAS, such an Act will reduce the complexity of nationwide marketing of appliances by applying consistent efficiency standards on a nationwide basis; and

WHEREAS, continued investment in energy conservation is an essential component of national energy independence and economic growth; and

WHEREAS, energy conservation will permit the United States to become more independent of the world oil market and will reduce our vulnerability to the interruption of foreign energy supplies; and

WHEREAS, appliance energy conservation standards are one of the most cost effective means of achieving energy efficiency; and

WHEREAS, agreement on national appliance standards has been reached between manufacturer and consumer interest groups; and

WHEREAS, national appliance energy standards more stringent than existing State standards should be set by Congress; and

WHEREAS, national appliance energy standards will benefit both appliance manufacturers and consumers by avoiding the costs of complying with multiple State appliance standards; now, therefore, be it

RESOLVED, that the National Association of Regulatory Utility Commissioners (NARUC) supports the concept of a National Appliance Energy Conservation Act which sets standards that are effective and reasonable, while at the same time NARUC supports State initiatives to establish appliance standards, until such time as Federal legislation is effective; and, be it further

RESOLVED, that the NARUC, in endorsing and strongly supporting this Act, specifically requests that the preemption process should be sufficiently flexible to allow States to address more stringent standards based on State specific economic and technical issues as they may arise.

Sponsored by the Committee on Energy Conservation
Adopted July 31, 1986

Senator EVANS. Thank you.
Mr. Morron.

STATEMENT OF THOMAS D. MORRON, VICE PRESIDENT, CUSTOMER SERVICES AND MARKETING, EDISON ELECTRIC INSTITUTE

Mr. MORRON. Thank you, Mr. Chairman. My name is Tom Morron and I am vice president of customer services and marketing for the Edison Electric Institute. EEI is the association of the Nation's investor-owned electric utilities. Our member companies serve 96 percent of the customers of the investor-owned segment of the industry. It generates 75 percent of all the electricity in the United States and serves more than 73 percent of all electric customers in the country.

We appreciate the opportunity to present testimony to you here this morning and we are heartily in support of S. 2781.

You have my written testimony, and I would merely hit some of the high points of that written testimony.

Senator EVANS. The full statement will be put in the record.

Mr. MORRON. Thank you, Mr. Chairman.

Those high points obviously being that by improving the efficiency levels of major residential appliances, we believe the legislation will provide our customers with an additional option to control energy costs. We similarly believe that a patchwork of 50 different State standards will dramatically impair traditional economies of scale in the appliance manufacturing industry as well as disrupt well-established distribution networks to the ultimate disadvantage of customers across the country.

We have had an opportunity, Mr. Chairman, here this morning to hear finally what the American Gas Association had in mind by way of amendment, and I would like to comment briefly on the EEI reaction to it.

First of all, the Edison Electric Institute sees no real justification for artificially dividing furnace equipment into large and small categories. In order to sustain this contention, Mr. Chairman, we would urge you to look forward, as we have, toward the time at which this legislation would impose the efficiency standards and begin to look at the composition of the housing stock that will be in place at that time.

What EEI sees is housing and weatherization trends that lead to a decline in the size of heating and cooling equipment necessary for climate conditioning of that dwelling. Most especially, in the multifamily area, we see a trend upward in raw numbers of multifamily dwellings and down in square footage.

Hence, the assumption that a 45,000 or 50,000 Btu-hour unit only supplies the needs of smaller, lower-income type customers we believe is inappropriate. By our analysis, using HUD and FHA energy budget standards of between 17 and 21 Btu's per square foot, we see that a 45,000 to 50,000 Btu-an-hour furnace will supply the needs of approximately 50 percent of the new single-family homes and certainly a greater percentage of multifamily dwellings at the time the standards take effect.

Second, we would submit that there is no justification for the assertion made here this morning that electric resistance heat is the customer's only option. Given most recent data, we find that in 1985 approximately 18.5 percent of the heat pumps in the United States that were shipped were of capacities of 22,000 Btu-per-hour or less. They account, thus, for a very small type square-foot dwelling.

And hence, the customer is already exercising, in fairly substantial numbers, options other than those associated with resistance electric heating. Furthermore, I believe that if, in the context of examining where growth seems to be taking place the fastest, you will find that these dwellings are being added in what has traditionally been come to known as the Sunbelt areas in which an extremely heavy percentage of dwellings are air-conditioned.

Finally, we would submit that there really is no justification for the charge that resistance electric heating is the least inefficient of all forms of heating, per se. Judged on the basis of Btu's submitted versus the number of Btu's produced, electric resistance heating produces one for one. Hence, an efficiency ratio of 100 percent.

Thus, we would submit that the amendments proposed here this morning digress significantly from the intent of the coalition in providing and bringing this legislation forward. We would certainly like to congratulate that first panel you heard this morning for achieving the consensus they did.

I am sure you are well aware, Mr. Chairman, of the difficulties involved in achieving such a tenuous coalition. We feel that the intent of these amendments violates the spirit of that coalition and would not provide for unified national standard.

Let me speak for a moment to the issue of self-interest of the electric utility industry. As the legislation was originally proposed, the efficiency standard improvements were required on both electric and gas furnaces. I would refer you to page 7 of my written statement, where we indicate that while we feel this may put us at a competitive disadvantage in certain areas, we feel the net benefits of the bill are certainly enough to outweigh this perceived competitive risk.

Finally, if the committee chooses to consider amendments, the EEI would urge that they do so on a show-cause basis, using the proposed standards as the fundament if, as is obvious, there are some differences of opinion on the proposed standards. EEI does not wish its disagreement with artificially petitioning the market and setting multiple standard to stop the progress of this very desirable legislation.

If for some reason amendments of the sort proposed by the American Gas Association are given serious consideration by the committee, we would strongly urge that the standards proposed be adopted and that perhaps a formal rulemaking be undertaken by the Department of Energy to determine a, whether there is any justification for isolating a particular size furnace from the rest of the marketplace and, if so, whether or not this particular size of furnace should be granted freedom to operate at lower efficiencies than the balance of the marketplace.

Mr. Chairman, I repeat for emphasis. EEI does not wish to see our disagreement with the American Gas Association to impede the establishment of these standards. We would rather see the standard set and a procedure established to resolve these technical disagreements outside of the courts of the Halls of Congress.

Thank you very much for your time.

[The prepared statement of Mr. Morron follows:]

STATEMENT OF THE
EDISON ELECTRIC INSTITUTE
BEFORE THE SENATE SUBCOMMITTEE ON
ENERGY REGULATION AND CONSERVATION
ON THE
NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

PRESENTED BY
THOMAS D. MORRON
VICE PRESIDENT, CUSTOMER SERVICES & MARKETING

SEPTEMBER 16, 1986

GOOD MORNING. MY NAME IS TOM MORRON AND I AM VICE PRESIDENT OF CUSTOMER SERVICES AND MARKETING FOR THE EDISON ELECTRIC INSTITUTE. EEI IS THE ASSOCIATION OF THE NATION'S INVESTOR-OWNED ELECTRIC UTILITIES. EEI'S MEMBER COMPANIES SERVE 96 PERCENT OF THE CUSTOMERS OF THE INVESTOR-OWNED SEGMENT OF THE ELECTRIC UTILITY INDUSTRY. EEI MEMBERS GENERATE 75 PERCENT OF ALL ELECTRICITY IN THE COUNTRY AND SERVE MORE THAN 73 PERCENT OF ALL ELECTRIC CUSTOMERS IN THE NATION.

EEI APPRECIATES THE OPPORTUNITY TO PRESENT TESTIMONY IN SUPPORT OF THE NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986.

THE ELECTRIC UTILITY INDUSTRY IS JUSTIFIABLY PROUD OF ITS RECORD OF ASSISTING ITS CUSTOMERS IN ENERGY CONSERVATION. OUR NEED TO PROMOTE THE EFFICIENT USE OF ENERGY AND TO CONTROL THE DEMAND FOR ELECTRICITY IS WELL ESTABLISHED. NO ELECTRIC UTILITY WANTS TO SPEND FUNDS TO BUILD COSTLY NEW POWER PLANTS IF IT CAN SHAPE DEMAND SO AS TO USE EXISTING GENERATING CAPACITY MORE EFFICIENTLY.

IT IS WITH THIS BACKGROUND THAT EEI HEARTILY SUPPORTS THE NATIONAL APPLIANCE ENERGY CONSERVATION ACT AS INTRODUCED BY SENATOR EVANS. BY IMPROVING THE EFFICIENCY LEVELS OF MAJOR RESIDENTIAL APPLIANCES, THIS LEGISLATION WILL PROVIDE OUR CUSTOMERS AN ADDITIONAL OPTION TO CONTROL ENERGY COSTS. IT IS ALSO VERY IMPORTANT THAT THE APPLIANCE EFFICIENCY STANDARDS ESTABLISHED ARE UNIFORM NATIONWIDE, THUS PRESERVING THE MANUFACTURERS' ECONOMIES-

OF-SCALE AS WELL AS HIGHLY EFFICIENT, WELL ESTABLISHED DISTRIBUTION NETWORKS WHICH HAVE BENEFICIALLY SERVED THE NATION'S CONSUMERS FOR MANY YEARS.

WITHOUT THIS UNIFORMITY, THE EROSION OF CURRENT PRODUCTION EFFICIENCIES COULD CAUSE THE INCREASE IN THE PURCHASE PRICES OF NEW ENERGY-EFFICIENT APPLIANCES TO OUTWEIGH SAVINGS IN ENERGY COSTS. WITHOUT NATIONAL STANDARDS, THE NECESSITY TO CONTINUALLY RESTRUCTURE DISTRIBUTION NETWORKS SO AS TO KEEP PACE WITH NEW STANDARDS IN EACH STATE COULD ALSO CAUSE FURTHER UPWARD PRESSURE ON CONSUMER APPLIANCE PRICES.

ELECTRIC UTILITY COMPANIES HAVE RECOGNIZED THE IMPORTANCE OF APPLIANCE ENERGY EFFICIENCY FOR MANY YEARS. MUCH OF THE IMPROVEMENT IN APPLIANCE EFFICIENCY WHICH HAS OCCURRED OVER THE LAST EIGHT TO TEN YEARS, FOR EXAMPLE, IS DIRECTLY ATTRIBUTABLE TO A MULTIPLICITY OF INNOVATIVE INCENTIVE PROGRAMS DEVELOPED AND OFFERED BY THE ELECTRIC UTILITY INDUSTRY FOR ITS CUSTOMERS. FOR INSTANCE, MORE THAN 75 OF OUR COMPANIES HAVE PROVIDED INCENTIVES FOR THE PURCHASE OF ENERGY-EFFICIENT REFRIGERATORS, FREEZERS, AIR-CONDITIONERS AND HEAT PUMPS (SEE ATTACHED EPRI SURVEY). THESE INCENTIVES PROGRAMS FOR EFFICIENT APPLIANCES HAVE COME IN A VARIETY OF FORMS, RANGING FROM ZERO-INTEREST FINANCING TO DIRECT CASH PAYMENTS.

EFFICIENT APPLIANCES ARE ONE OF FOUR MAJOR DEMAND-SIDE OPTION CATEGORIES THAT THE ELECTRIC UTILITY INDUSTRY HAS OFFERED TO OUR CUSTOMERS. THE OTHER CATEGORIES ARE: BUILDING ENVELOPE OPTIONS, EFFICIENT EQUIPMENT AND APPLIANCE OPTIONS, THERMAL STORAGE EQUIPMENT

OPTIONS, AND ENERGY AND DEMAND CONTROL EQUIPMENT OPTIONS. ALSO ATTACHED TO THIS TESTIMONY IS A SUMMARY OF THE INDUSTRY'S APPROACH TO SERVING OUR CUSTOMERS NEEDS, ENTITLED "DEMAND-SIDE MANAGEMENT - OVERVIEW OF KEY ISSUES." THIS REPORT IS THE FIRST IN A THREE-VOLUME INDUSTRY SERIES AND FOCUSES ON THE BROAD ISSUES OF DEMAND-SIDE MANAGEMENT. THESE ISSUES RANGE FROM OUR COMPANIES' MOTIVES FOR CONSIDERING DEMAND-SIDE ALTERNATIVES TO TECHNIQUES FOR ANALYZING THE COST EFFECTIVENESS OF ALTERNATIVES, TO ANALYSES OF IMPLEMENTATION ISSUES AND FINALLY TO DESCRIPTIONS OF ACTUAL UTILITY PROGRAM EXPERIENCES.

TO HIGHLIGHT THE IMPACT OUR INDUSTRY HAS HAD, A QUICK REVIEW OF AIR CONDITIONER EFFICIENCIES INDICATES THAT THE MARKET-WEIGHTED EFFICIENCY OF SPLIT SYSTEM AIR CONDITIONERS IMPROVED 5 PERCENT FROM 1976 TO 1980. SINCE OUR INDUSTRY INSTITUTED REBATES FOR EFFICIENT AIR CONDITIONERS, THE INCREASE IN EFFICIENCY WAS 14.4 PERCENT OVER A SUBSEQUENT FOUR-YEAR PERIOD. THIS IMPACT IS FURTHER HIGHLIGHTED WHEN ONE FOCUSES ON THE GEOGRAPHIC DISTRIBUTION OF THE EFFICIENT AIR-CONDITIONER SHIPMENTS. FLORIDA, CALIFORNIA AND TEXAS MAKE UP THE PREPONDERANCE OF THOSE SHIPMENTS SINCE 90 PERCENT OF THE NEW HOMES IN THESE THREE STATES ARE AIR-CONDITIONED. ELECTRIC UTILITIES IN THESE THREE STATES -- FLORIDA, TEXAS AND CALIFORNIA -- WERE ALSO THE LEADERS IN DEVELOPING INNOVATIVE REBATE PROGRAMS. WE BELIEVE THE CORRELATION BETWEEN THE START OF REBATE PROGRAMS IN THE IMPORTANT AIR- CONDITIONING MARKETS AND AIR-CONDITIONER EFFICIENCY IMPROVEMENTS IS BOTH INTUITIVE AND OBVIOUS. OUR COMPANIES' PROGRAMS MOVED THE MARKET-WEIGHTED EFFICIENCIES.

EACH COMPANY HAS DESIGNED ITS DEMAND-SIDE PROGRAMS TO BEST FIT THE NEEDS OF ITS CUSTOMERS AND THE UTILITY'S LOAD CHARACTERISTICS. I HAVE ATTACHED TO MY TESTIMONY A BRIEF DESCRIPTION OF SOME OF THE OPTIONS FOR WHICH OUR UTILITIES HAVE DESIGNED PROGRAMS. ON A NATIONAL BASIS, THE ELECTRIC POWER RESEARCH INSTITUTE HAS ESTIMATED THAT DEMAND-SIDE MANAGEMENT PROGRAMS HAVE REDUCED CAPACITY REQUIREMENTS BY 13 GIGAWATTS SINCE 1973. THE ANTICIPATED REDUCTION IN DEMAND RESULTING FROM THESE PROGRAMS WILL AMOUNT TO 50 GIGAWATTS BY THE YEAR 2000. THESE MODIFICATIONS IN DEMAND ENABLE THE ELECTRIC UTILITY INDUSTRY TO USE ITS GENERATING CAPACITY MORE EFFICIENTLY AND TO FORESTALL THE NEED TO BUILD NEW GENERATION.

ALTHOUGH CUSTOMERS HAVE HISTORICALLY HAD TO PAY MORE FOR HIGH EFFICIENCY APPLIANCES, THE ENERGY COST SAVINGS TYPICALLY PROVIDE REASONABLE PAYBACKS. UTILITY-PROVIDED INCENTIVES HAVE ACCELERATED THE CUSTOMER'S PAYBACK PERIOD. AS RESULT OF THE REPLACEMENT OF INEFFICIENT EQUIPMENT, UTILITIES BENEFIT FROM REDUCED ENERGY REQUIREMENTS AND LOWER DIVERSIFIED DEMANDS WHILE CUSTOMERS ARE BETTER ABLE TO MEET THEIR ENERGY NEEDS AND MANAGE THEIR ENERGY COSTS. BECAUSE OF THE HIGH PERCENTAGE OF HOMES WITH ELECTRIC APPLIANCES, HIGH-EFFICIENCY APPLIANCES GENERALLY REPRESENT A SUBSTANTIAL OPPORTUNITY FOR STRATEGIC CONSERVATION PROGRAMS.

UTILITY-DEVELOPED PROGRAMS HAVE STOOD AS EXAMPLES OF HOW THE MARKETPLACE CAN WORK EFFICIENTLY IN PROMOTING COST-EFFECTIVE ENERGY INVESTMENTS. HOWEVER, AS VARIOUS STATES DEVELOPED THEIR OWN, UNIQUE AND DIFFERENT APPLIANCE EFFICIENCY STANDARDS, APPLIANCE MANUFACTURERS HAVE BEEN COMPELLED TO DEVELOP PRODUCTS FOR INDIVIDUAL

STATES, THEREBY REDUCING THE TRADITIONAL PRODUCTION AND DISTRIBUTION EFFICIENCIES WHICH HELPED MITIGATE RISING CONSUMER PRICES. THIS LEGISLATION AS INTRODUCED WOULD PROVIDE A UNIFORM BASE LINE OF STANDARDS NOT ONLY FOR APPLIANCE MANUFACTURERS BUT FOR UTILITY PLANNERS AND CONSUMERS AS WELL.

I WANT TO EMPHASIZE THAT THE AMOUNT OF ENERGY OR DEMAND SAVINGS RESULTING FROM THE OPERATION OF MORE EFFICIENT APPLIANCES WILL DEPEND IN LARGE DEGREE ON CUSTOMER BEHAVIOR. STUDIES BY OAK RIDGE NATIONAL LABORATORIES INDICATE THAT HUMAN NATURE DIRECTS SOME CONSUMERS TO INCREASE THE USE OF AN EFFICIENT APPLIANCE WHEN REPLACING AN OLDER, LESS EFFICIENT APPLIANCE OF THE SAME TYPE OR EVEN TO ADD TO THEIR APPLIANCE STOCK. FOR EXAMPLE, THE USE OF A MORE EFFICIENT AIR-CONDITIONER MAY ALLOW A CUSTOMER TO USE AIR-CONDITIONING MORE FREQUENTLY, THEREBY INCREASING COMFORT BUT MAINTAINING THE SAME ENERGY BILL. ALTHOUGH THIS SITUATION DOES REPRESENT GREATER ENERGY VALUE TO THE CUSTOMER, IT ALSO MAKES ACCURATE FORECASTING OF OVERALL ENERGY USE REDUCTIONS QUITE DIFFICULT UNTIL HIGH-EFFICIENCY APPLIANCE MARKET PENETRATIONS INCREASE TO THE POINT WHERE DESIRABLE TRENDS ARE EVIDENT.

EEI AND ITS MEMBERS ARE NOT IN A POSITION TO STATE UNEQUIVOCALLY THAT THE LEVELS SPECIFIED IN THE BILL ARE, IN THE CLASSICAL SENSE, COST EFFECTIVE TO CUSTOMERS. WE ALSO CANNOT DETERMINE PRECISELY THE IMPACT OF THE STANDARDS ON OUR INDUSTRY AS A WHOLE. IT IS DIFFICULT ENOUGH TO ESTIMATE PRECISELY HOW THE COLLECTIVE ENERGY SAVINGS FROM THOUSANDS UPON THOUSANDS OF INDIVIDUAL CONSUMERS IN A SINGLE UTILITY SERVICE-TERRITORY MAY TRANSLATE TO REDUCTIONS

IN ENERGY BEING GENERATED BY A POWER PLANT IN THAT SYSTEM. THIS DIFFICULTY IS COMPOUNDED WHEN ONE ATTEMPTS TO PREDICT HOW CUMULATIVE ENERGY SAVINGS ACROSS THE COUNTRY MAY TRANSLATE TO REDUCTIONS IN ENERGY GENERATED BY POWER PLANTS ON A NATIONWIDE BASIS. ANY PROJECTIONS OF ENERGY SAVINGS ARE HYPOTHESIZED AND AFFECTED BY HUNDREDS OF INPUTS. SUFFICE IT TO SAY THAT WE BELIEVE THE SAVINGS IN ENERGY AND DEMAND FROM THIS LEGISLATION WILL BE TO OUR CUSTOMERS' BENEFIT AND IS, THEREFORE, WORTHY OF YOUR FAVORABLE CONSIDERATION.

THERE IS A SPECIFIC FEATURE ABOUT THE BILL ON WHICH EEI WOULD LIKE TO COMMENT. THE IMPROVEMENT WHICH THE LEGISLATION REQUIRES IN AIR-CONDITIONER AND HEAT PUMP EFFICIENCY REPRESENTS A 13-16 PERCENT INCREASE IN EFFICIENCY OVER 1985 MARKET-WEIGHTED SALES FOR THOSE TYPES OF APPLIANCES. THIS IS A SUBSTANTIAL INCREASE IN ENERGY EFFICIENCY, AND WE APPLAUD THE MANUFACTURING COMMUNITY FOR AGREEING TO SUCH AN AGGRESSIVE STANDARD. HOWEVER, THE INCREASE IN EFFICIENCY IS NOT CONSISTENT ACROSS ALL THE SUBJECT APPLIANCES. AS AN EXAMPLE, GAS FURNACE EFFICIENCY IMPROVEMENTS TO A 78 PERCENT ANNUAL FUEL USE EFFICIENCY (AFUE) LEVEL REPRESENT A 5.6 PERCENT INCREASE OVER THE 1985 MARKET-WEIGHTED SALES AVERAGE OF 74 PERCENT AFUE. IF THE IMPROVEMENT IN GAS FURNACES WERE MADE COMPARABLE TO THE IMPROVEMENT REQUIRED FOR AIR-CONDITIONERS AND HEAT PUMPS, A MINIMUM EFFICIENCY OF 85 PERCENT AFUE WOULD BE REQUIRED FOR GAS FURNACES. SINCE THE PROPOSED LEGISLATION DOES NOT REQUIRE SUCH COMPARABILITY, IT MAY APPEAR TO PUT ELECTRIC EQUIPMENT AT A COMPETITIVE DISADVANTAGE. NEVERTHELESS, WE FEEL THAT THE PROVISION OF A UNIFORM, NATIONWIDE STANDARD CARRIES WITH IT BENEFITS SUFFICIENT TO OUTWEIGH A PERCEIVED COMPETITIVE RISK.

In closing, I want to emphasize EEI's strong support for this bill and urge the Congress to act as soon as possible. Thank you for the opportunity to present the electric utility industry's viewpoint.

EFFICIENT EQUIPMENT AND APPLIANCE OPTIONS

OPTION[a]	DESCRIPTION	DETAILS AND EXAMPLE SPECIFICATIONS
ELECTRIC SPACE HEATING		
High Efficiency Air Source Central Heat Pump (A-23)	A space heating and cooling system that uses a vapor compression refrigeration cycle to transfer heat from outdoor air into the house during the heating season and from inside air to the outdoors during the cooling season. Energy savings over alternative heating methods can be substantial. Many newer systems operate at higher efficiencies and at lower outdoor temperatures with less backup heating energy than did units available a few years ago.	• High-efficiency features include more efficient motors, larger heat exchanger coils, and two-speed compressors. • Heating COPs from about 2.8 to 3.4 are available. • Heat pumps are suitable for many residential applications; air distribution ductwork is required.
Ground (and Surface) Water Source Heat Pump (A-25)	A heat pump that uses ground or surface water (e.g., from a well, lake, pond, etc.) rather than ambient air as a heat source and sink. These units are typically more efficient than air source heat pumps because the water tends to be a better heat source and sink than ambient air.	• Suitable for most standard heat pump applications where a reliable water supply is available.
Ground-Coupled Heat Pump (A-27)	A heat pump that uses the earth rather than ambient air or groundwater as the heat source and sink. These units can be used in areas where a groundwater supply is either not available or unsuitable for heat pump use. Typical performance is similar to that of groundwater heat pumps.	• Suitable where soil conditions permit burying a ground-to-water heat exchange coil.
Multi-Zone Heat Pump (A-29)	A heat pump that couples a single outdoor compressor/heat exchanger with several indoor fan-heat exchanger units located in individual rooms or zones. This allows zonal temperature control in conjunction with relatively high heat pump efficiency. This is a new technology that has not yet been fully evaluated.	• Ductwork is not required, but refrigerant piping must be run to each indoor unit.
Room Heat Pump (A-31)	A relatively small, packaged heat pump used for heating and cooling individual rooms or zones. Currently available equipment is suitable mainly for moderate climate areas.	• Provides capability for high efficiency heating in retrofit or add-on applications.
Add-on Heat Pump (A-35)	Standard space heating heat pump installed as a retrofit to an existing fossil-fuel furnace. The fossil system then serves as the backup heat source, operating only when the heat load of the house exceeds the heat pump's heating capacity.	• Provides central air conditioning as well as retrofit high-efficiency heating.
Dual-Fuel Heating System (A-33)	A combination electric resistance and fossil fuel heating system by which house heating demands are met by electricity during all but the utility's peak periods. The fossil fuel system provides peak-period heating energy. The utility controls the switch-over operations, usually via receiver switches.	• Available as packaged systems for new installations or as components to retrofit both electric and fossil-fueled systems.
Active Solar Space Heating with Electric Backup (A-37)	A space heating system employing solar collectors and an active heat transfer fluid circulation system to deliver heat to the house. Backup heating is most often provided by resistance heaters.	• Usually requires custom sizing and configuring for each location. • Solar contribution is typically from 20 to 60 percent of total space heating energy.
Task Heating (A-39)	The use of relatively small space heaters to provide heating in portions of a house for specific occupancy or task requirements without increasing the duty cycle of the existing whole-house heating system.	• Examples include radiant heaters, portable convectors, quartz heaters, etc.

[a] Numbers in parentheses refer to the page number of the Appendix on which the corresponding Technical Brief appears.

Table 4-2.

EFFICIENT EQUIPMENT AND APPLIANCE OPTIONS

OPTION[a]	DESCRIPTION	DETAILS AND EXAMPLE SPECIFICATIONS
Zoned Resistance Heating (A-41)	Zoned control of standard resistance heaters to allow independent heating of separate areas of a building, with greater operating flexibility and lower operating cost than that of a centrally-controlled system.	• Can be used in most houses. • Existing centrally controlled baseboard resistance systems can be retrofit with additional thermostats for zone control.
EFFICIENT SPACE COOLING EQUIPMENT		
High EER Air Conditioner (A-49)	An energy-efficient space cooling device operating on a vapor-compression cycle. High efficiencies are achieved through the use of more efficient motors, larger heat exchangers, and better insulation than on standard models.	• Available in both room and central unit configurations.
High Efficiency Heat Pumps (A-23, 25, 27, 29, 31, 35)	(Refer to Electric Space Heating Options)	• Several configurations are available. • Cooling EERs typically range from about 7 to 10, sometimes higher.
EFFICIENT WATER HEATING EQUIPMENT		
Heat Pump Domestic Water Heater (A-43)	An air-to-water heat pump that heats water for domestic purposes, drawing a portion of the water-heating energy from ambient air. The devices use less energy to heat water than do resistance units under most circumstances.	• Energy savings can be on the order of 40 to 60 percent of the energy required by standard resistance heaters. • Can be used in retrofit or new installations.
Heat Recovery Domestic Water Heater (A-45)	A device that recovers excess heat from some equipment or system and transfers that heat to water for domestic purposes. The most common residential units are air conditioner desuperheaters that pick up heat from the refrigerant vapor and transfer it to the hot water system.	• Best suited to areas with high air conditioning loads. • Requires cutting into air conditioner refrigeration lines unless factory installed.
Solar Domestic Water Heater with Electric Backup (A-47)	A system using solar collectors to transfer heat from the sun to water for domestic purposes. The heat transfer fluid is often pump-circulated through the collectors and a storage tank. Backup resistance heaters are generally provided.	• Suitable for new and some retrofit applications. • Successful operation depends on proper orientation and available solar energy.
HIGH EFFICIENCY APPLIANCES		
Energy-Efficient Cooking Appliances (A-51)	Appliances that use less energy to provide end use loads equivalent to those served by standard appliances. (This describes all appliances and equipment listed below.)	• Microwave ovens speed cooking and use less energy than standard stoves.
Energy-Efficient Clothes Washers and Dishwashers (A-53)		• Efficient clothes washers and dishwashers use higher efficiency motors and include additional energy saving cycles that use less hot water or drying energy.
Energy-Efficient Refrigerators and Freezers (A-55)		• Efficient refrigerators use better insulation and door seals, more efficient motors.
Energy-Efficient Lighting Fixtures and Lamps (A-57)		• Fluorescent lamps provide more light than incandescent lamps for less energy consumption.

Table 4-2.

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CHOICE
BOOKSHELF

DEMAND-SIDE MANAGEMENT
Overview of Key Issues

VOLUME
ONE
1984

Electricity. It's the Power of Choice.™

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DEMAND-SIDE MANAGEMENT: OVERVIEW OF KEY ISSUES

In brief...

From the energy issues first raised in the 1970s, electric utility companies have learned the importance of a flexible and diverse management strategy that will help them succeed in an increasingly competitive and uncertain market. A key challenge of the 1980s will be to integrate traditional supply planning and operation with the emerging concept of actively influencing the demand for electricity—i.e., demand-side management. Within this context, demand-side management can help assure efficient utilization of facilities and augment the range of choices available to utility management in meeting the challenges of the future.

This report is the first in a three-volume series designed to give utility executives and their staffs a comprehensive background in demand-side management. Intended primarily for the utility executive, this volume focuses on the broad issues of demand-side management ranging from motives for considering demand-side alternatives, to techniques for analyzing the cost-effectiveness of alternatives, to analyses of implementation issues, and finally to descriptions of actual utility experiences. In summary, the key issues that will be developed are:

- Demand-side management can offer a broad range of alternatives for strategically adding to or reducing load. Thus, it warrants examination by virtually every electric utility. Demand-side management is equally applicable and desirable for investor-owned, municipal, and rural electric utilities.
- Demand-side management is dynamic. There is a need to constantly assess the direction and emphasis of demand-side programs and a need to alter course as economic or operating conditions change.
- Demand-side management can provide utility customers with the opportunity they desire to better manage their total energy cost and usage, but in a manner that will also benefit the utility.
- Demand-side management also includes many new activities, such as the encouragement of electrification, which can lead to increased efficiency in customer energy use and to improved customer productivity.
- The impacts of demand-side management are highly utility specific, but there is a wealth of data and a very rapidly growing utility experience base on which to draw.
- Demand-side management programs warrant the same level of attention and resources that are given to the generating plant and other supply-side requirements—i.e., the years of planning and scheduling, rigorous analytical modeling, and calculations concerning reliability, operation, and maintenance.
- The extent to which utilities can successfully carry out demand-side programs and objectives will depend on a number of factors, none of which will be more important than the active support of top management. The essence of demand-side management lies not in new rate structures, advertising copy, or hardware, but in new—or renewed—principles, beliefs, and management philosophies about how utilities can relate to their customers.

The three-volume series on demand-side management has been undertaken as a joint effort of the Electric Power Research Institute (EPRI) and the Edison Electric Institute (EEI). EPRI provided project funds for the underlying research activities, while EEI provided supplemental funds for the design and production of the report.

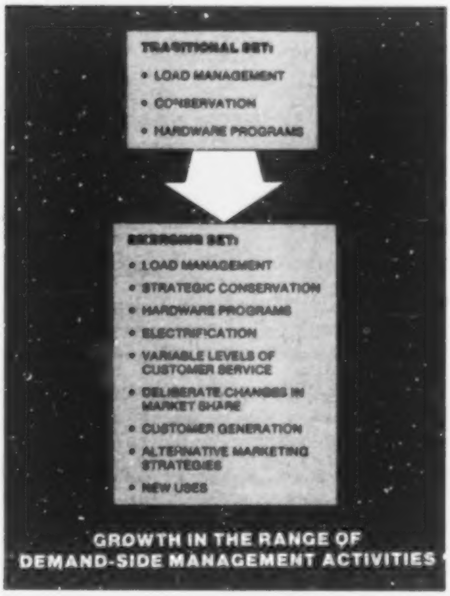
The three-volume series has been developed, in part, to provide research support for EEI's new national marketing program "Power of Choice." The report also serves as an introduction to EPRI's continuing commitment to research in demand-side management.

Chapter 1–INTRODUCTION

WHAT IS DEMAND-SIDE MANAGEMENT?

Demand-side management is the planning and implementation of those utility activities designed to influence customer use of electricity in ways that will produce desired changes in the utility's load shape—i.e., changes in the time pattern and magnitude of a utility's load. Utility programs falling under the umbrella of demand-side management include: load management, new uses, strategic conservation, electrification, customer generation, and adjustments in market share.

Demand-side-management includes only those activities that involve a deliberate intervention by the utility in the marketplace so as to alter its load shape. Under this definition, customer purchases of energy efficient refrigerators as a reaction to the perceived need for conservation would not be classified as demand-side management. On the other hand, a program that encourages customers to install energy efficient refrigerators, through either incentives or advertising, meets the definition of demand-side management. While this distinction between "naturally" occurring and deliberately induced changes in energy consumption and load shape is at times difficult to make, it is nevertheless important.



GROWTH IN THE RANGE OF DEMAND-SIDE MANAGEMENT ACTIVITIES

Note also that demand-side management extends beyond conservation and load management to include programs designed specifically to build load in both peak and off-peak periods. Thus, demand-side management alternatives warrant consideration by utilities involved with ambitious construction programs, those with high reserve margins, and those facing high marginal costs.

Another important concept to consider in defining demand-side management is that of cost control/customer options. While demand-side management includes programs designed for all customer classes, the term cost control/customer options has been used to describe certain of those alternatives applicable specifically to the residential class. In this report, this term refers to those demand-side alternatives that give residential customers the opportunity to control their electricity usage and total energy bills.

Cost control/customer options involve a partnership between the utility and its customers. The utility designs and offers the program to its customers—but it is the customer who ultimately decides whether or not to participate in the program. Although participation in the program is voluntary, utilities can offer a wide range of inducements to encourage participation.

Definitions for demand-side management and other key concepts that will help the reader in understanding this report are given on the next page.

WHY CONSIDER DEMAND-SIDE MANAGEMENT?

Why should a utility be interested in demand-side management? Since the early 1970s, economic, political, social, technological, and resource supply factors have combined to change the utility industry's operating environment and its outlook for the future. Many utilities are faced with staggering capital requirements for new plants, significant fluctuations in demand and energy growth rates, declining financial performance, and regulatory and consumer concern about rising prices. While demand-side management is not a cure-all for these difficulties, it does provide utility management with a great many additional alternatives. These demand-side alternatives are equally appropriate for consideration by investor-owned, municipal, or rural electric utilities.

For utilities with strong load growth, load management and strategic conservation can provide an effective means to reduce or postpone construction of new generating facilities. For other utilities, electrification and deliberate

KEY DEFINITIONS

DEMAND-SIDE MANAGEMENT — the planning and implementation of those utility activities designed to influence customer use of electricity in ways that will produce desired changes in the utility's load shape—i.e., changes in the pattern and magnitude of a utility's load. Demand-side management encompasses the entire range of management functions associated with directing demand-side activities, including program planning, evaluation, implementation, and monitoring. Opportunities for demand-side management can be found in all customer classes, including residential, commercial, industrial, and wholesale.

DEMAND-SIDE PLANNING — those activities related to the design and assessment of utility programs directed at influencing customer use of electricity.

DEMAND-SIDE IMPLEMENTATION — those activities related to the installation of a demand-side program once its cost-effectiveness has been determined.

LOAD SHAPE OBJECTIVES — the changes in customer use of electricity desired by the utility in order to achieve specific operational goals. These desired load shape changes can be used to characterize the potential impact of alternative demand-side management programs. Although there is an infinite combination of load shape changing possibilities, six have been chosen in this study to illustrate the range of possibilities: peak clipping, valley filling, load shifting, strategic conservation, strategic load growth, and flexible load shape.

LOAD MANAGEMENT — utility activities designed to influence the timing and magnitude of customer use of electricity. To many people, the traditional load shape objectives of load management include peak clipping, valley filling, and load shifting.

DEMAND-SIDE ALTERNATIVES — products and services that provide the vehicle by which demand-side management programs can influence the use of electricity. Demand-side alternatives can be characterized in four ways: by the intended load shape objective of the demand-side program; by the customer end use that is affected; by the technology or equipment involved; and by the manner in which market implementation is achieved.

COST CONTROL/CUSTOMER OPTIONS — those demand-side alternatives that give residential customers greater control over their electricity usage and their total energy bill.

MARKET IMPLEMENTATION OF DEMAND-SIDE ALTERNATIVES — those specific programs such as direct customer contact and alternative rates that utilities undertake to increase customer adoption of demand-side programs.

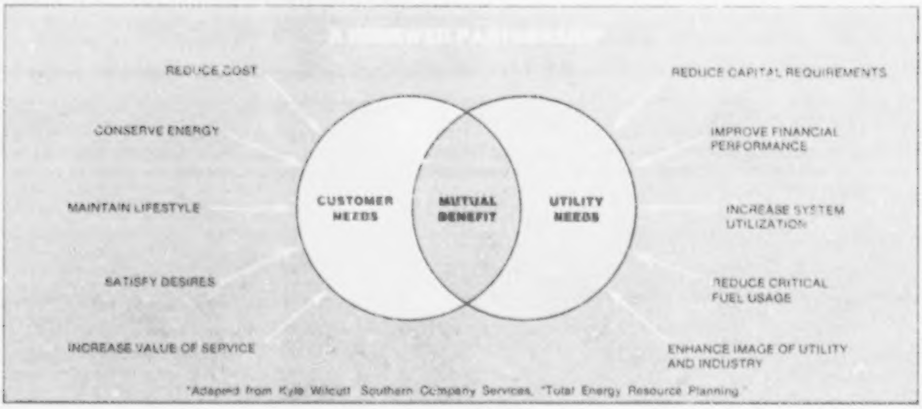
NEW USES — electricity-using products that either provide new services or improve the quality or desirability of a service over conventional alternatives. Generally, these products expand existing markets or open brand new markets. Examples include advanced heat pumps, home computers, and electrification.

ELECTRIFICATION — the group of electricity-based and electricity-intensive technologies that offer the potential of significant productivity improvements and energy efficiency increases in manufacturing. Examples include robotics and industry automation, laser-based materials processing, and microwave heating and drying.

increases in the market share of energy intensive uses can improve the utility load characteristics and optimize the reserve margin. Aside from these rather obvious cases, changing the load shape that a utility must serve can reduce operating costs. Changes in the load shape can permit adjustments in plant loadings, thus increasing the use of more efficient plants and permitting the use of more domestically abundant and less expensive energy sources.

In the residential sector, cost control/customer options give the customer some capability to control monthly electric bills. Many electric customers who had become accustomed to stable prices up to the early 1970s have seen dramatic increases in their electric bills. In many parts of the country, these upward price trends are expected to continue, albeit at a somewhat reduced rate. Demand side alternatives, in particular, cost control/customer options, give customers a positive signal that the utility is concerned about high electric bills and is providing its customers with the means to control future expenditures for electricity.

In addition, many utilities that have only recently been promoting conservation programs are now expanding their use of demand side management by seeking new and alternative uses of electricity. These utilities have discovered that implementing demand-side management can lead to greater flexibility in facing the rapidly changing environment. While demand side management is not a


REDUCE COST
CONSERVE ENERGY
MAINTAIN LIFESTYLE
SATISFY DESIRES
INCREASE VALUE OF SERVICE
CUSTOMER NEEDS
MUTUAL BENEFIT
UTILITY NEEDS
REDUCE CAPITAL REQUIREMENTS
IMPROVE FINANCIAL PERFORMANCE
INCREASE SYSTEM UTILIZATION
REDUCE CRITICAL FUEL USAGE
ENHANCE IMAGE OF UTILITY AND INDUSTRY

*Adapted from Kyle Wilcutt, Southern Company Services, "Total Energy Resource Planning."

panacea for all problems facing the utility industry, it does provide additional alternatives to the industry for meeting the challenges of the future.

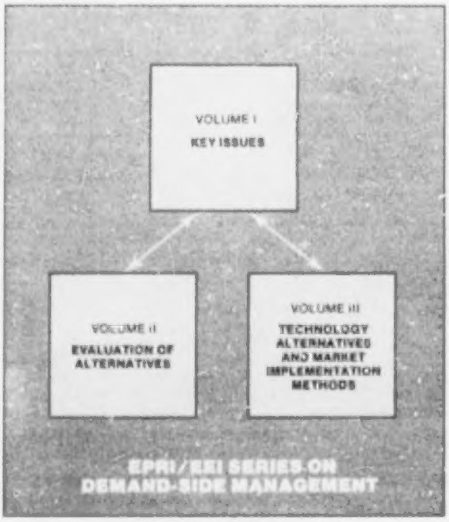
SELECTING THE RIGHT ALTERNATIVE

Finally, demand-side management encompasses planning, evaluation, implementation, and monitoring of activities selected from among a wide variety of technical alternatives. This wide range of alternatives mandates that utilities seriously consider demand-side management by including it as a part of their overall planning process. Due to the large number of alternatives, however, assessing which alternative is best suited for a given utility is not a trivial task. The choice is complicated by the fact that the attractiveness of alternatives is influenced strongly by utility specific factors, such as current generating mix, expected load growth, capacity expansion plans, load factor, load shapes for average and extreme days, regulatory climate, and reserve margins. Therefore, it is often inappropriate to transfer these varying specific factors from one service area to another without appropriate adjustments. In addition, the success of any alternative depends on the specific combination of marketing activities selected to aid in promoting customer acceptance.

REPORT OBJECTIVES

This three-volume series is designed to help utilities make some of the necessary planning decisions. These reports provide a road map to identify the most appropriate information and analysis techniques for a preliminary assessment of demand-side alternatives in a specific service area. It is not intended as a short-cut to the detailed analyses that are ultimately required before committing to a particular set of demand-side alternatives.

Demand-side alternatives must be evaluated by contrasting them with supply-side alternatives. Sophisticated analysis methods for supply-side alternatives are in


VOLUME I
KEY ISSUES
VOLUME II
EVALUATION OF ALTERNATIVES
VOLUME III
TECHNOLOGY ALTERNATIVES AND MARKET IMPLEMENTATION METHODS
EPRI/EEI SERIES ON DEMAND-SIDE MANAGEMENT

general use throughout the industry. An important objective of these reports is to familiarize utility personnel with these demand-side techniques, thus promoting effective interaction between the utility departments charged with implementing supply- and demand-side management, respectively.

This first volume provides utility executives and their staffs with an overview of demand-side management issues, analysis techniques, and technical alternatives. While technical explanations are minimized, there is sufficient detail to permit individual utilities to initiate a serious assessment of demand-side alternatives.

The second volume deals with the technical issues involved in analyzing which demand-side management alternatives are best suited for a given utility. Specifically, it describes a range of analysis techniques that enable utility personnel to interact effectively with supply-side planners so that the full range of available alternatives is explored.

The third volume discusses in detail the hardware options available to utilities in demand-side management. It contains brief technical descriptions of demand-side alternatives suitable for the residential sector. In addition, market implementation methods and issues are discussed. Overviews of both Volumes II and III are included as Chapters 3 and 4 of this volume.

Chapter 2–DISCUSSION OF ISSUES CRITICAL TO DEMAND-SIDE MANAGEMENT

This section focuses on eight critical issues that utilities considering demand-side management must resolve. Since this volume is intended to be an overview, the discussion is general but concise. This should not obscure the fact that these issues *are important* to the utility industry. The discussion is organized in a question and answer format from the viewpoint of utility executives. The eight questions are listed below.

ISSUES IN DEMAND-SIDE MANAGEMENT

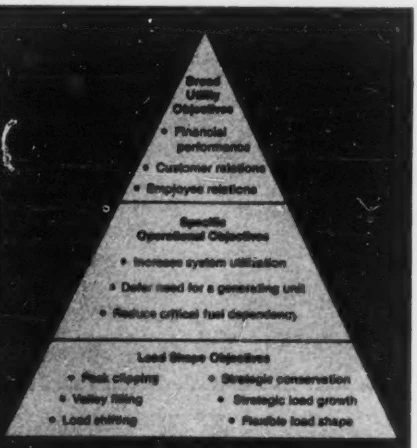
IN ORDER TO . . .	YOU NEED TO ASK . . .
ESTABLISH PROGRAM OBJECTIVES	**How can demand-side management help my utility achieve its objectives?** **See Page 12**
IDENTIFY ALTERNATIVES	**What type of demand-side management activities could my utility be getting involved in?** **See Page 15**
DETERMINE EVALUATION PROCESS	**How do I select those alternatives that are most beneficial for my utility?** **See Page 17**
FORECAST LOAD SHAPE IMPACTS	**What changes in the load shape can my utility expect by implementing demand-side alternatives?** **See Page 20**
DEVELOP MARKETING STRATEGIES	**How can my utility forecast and promote customer acceptance of demand-side alternatives?** **See Page 22**
IMPLEMENT PROGRAM	**What is the best way for my utility to implement selected demand-side alternatives?** **See Page 25**
MONITOR RESULTS	**How should my utility monitor the success of a demand-side management program?** **See Page 28**
INITIATE ACTION	**How do I get started in addressing demand-side management issues as they relate to my utility?** **See Page 31**

1) HOW CAN DEMAND-SIDE MANAGEMENT HELP MY UTILITY ACHIEVE ITS OBJECTIVES?

Although electric utility needs and characteristics vary widely within the industry, virtually every utility should examine demand-side management alternatives. Demand-side management can offer a utility a broad range of alternatives for reducing or adding load during a particular time of the day, during a certain season, or annually. The desirability of actually implementing demand-side alternatives and the specific nature of a program to do so depend on the detailed characteristics of the utility, its customers, and the demand-side alternatives themselves.

The Utility Planning Process

In some cases, reviews of demand-side management efforts have emphasized the impacts of a single demand-side alternative on the supply-side with little discussion on how that alternative was first selected. The preferred approach in assessing the overall viability of demand-side management is to incorporate the assessment as part of the utility's formal strategic planning process with demand-side alternatives being one of the many choices available to meet utility objectives. Discussion here focuses on a three-level hierarchy in utility planning related to demand-side management: establishing broad utility objectives, setting specific operational objectives, and determining desired load shape modifications.



HIERARCHY OF UTILITY PLANNING OBJECTIVES

The first level of a utility's formal planning process is to establish overall organizational objectives. These strategic objectives are quite broad and generally include such examples as improving cash flow, increasing earnings, or improving customer and employee relations. Certain institutional constraints may limit the achievement of these objectives. These constraints represent the obvious regulatory environment that all utilities face—regulation, environmental considerations, and the obligation to provide service of reasonable quality to customers within their designated service area. While all utilities face such institutional constraints, they differ between states and certainly between investor-owned and public power utilities.

While overall organizational objectives are important guidelines for utility long-range planning, there is a need for a second level of the formal utility planning process in which a utility's objectives are operationalized to guide utility management to specific actions. It is at this operational level or tactical level that demand-side management alternatives should be examined and evaluated. For example, an examination of capital investment requirements may show periods of high investment needs. Postponing the need for new construction through a demand-side program may reduce investment needs and stabilize the financial future of the utility.

Specific operational objectives are established on the basis of the conditions of the existing utility—its system configuration, cash reserves, operating environment, and competition. Operational objectives that can be addressed by demand-side alternatives include:

- Reducing the need for critical fuels
- Reducing or postponing capital investment in construction programs
- Holding the line on electricity costs
- Increasing revenues or sales
- Providing customers with options that provide a measure of control over their monthly electric bills
- Reducing risks by investing in diverse alternatives
- Increasing operating flexibility and system reliability
- Decreasing unit cost through more efficient loading of existing and planned generating facilities
- Satisfying regulatory constraints or rules
- Minimizing potential environmental impacts
- Improving the image of the utility.

Once designated, operational objectives are translated into desired load shape changes that can be used to characterize the potential impact of alternative demand-side management programs. Although there is an infinite combination of load shape changing possibilities, six have been chosen in this study to illustrate the range of possibilities: peak clipping, valley filling, load shifting, strategic conservation, strategic load growth, and flexible load shape. These six, discussed on page 14, are not mutually exclusive, and may frequently be employed in combinations.

The potential role that can be filled by demand-side management in a utility's planning process looks rather ambitious. Nevertheless, the demand-side approach does provide utility management with a whole new set of alternatives with which to meet the needs of the service area. The concept that the load shape is not fixed but can be altered deliberately with the utility and customer cooperating opens a new dimension in planning and operation.

Demand-Side Management Practice

The obvious question in response to the above claims is: Can demand-side management help achieve the broad range of operational objectives listed by merely changing the system's load shape? The answer is that numerous industries have found that changing the pattern of the demand for their product can be profitable. For example, telephone utilities have long offered reduced evening rates to shift demand and to encourage usage during non-business hours. Airlines offer night coach fares to build traffic during off-peak hours. Movie theaters offer reduced matinee prices to attract additional customers. All of these examples are deliberate attempts to change the demand pattern for a product to encourage efficient use of resources and thus profitability.

In part, the concept of looking at a utility as a business center is one of the philosophies of demand-side management. Incorporating this philosophy into the planning process will produce positive results for most utilities, including investor-owned, municipal, and rural electric utilities.

In a utility, the generating system is designed to serve the projected load in the least cost manner, given a specified level of desired reliability. Assuming, however, that the load shape is not fixed but may be altered, the cost of serving the load can be reduced still further. Cost reductions due to changes in the load shape arise primarily from three conditions:

- Reduction in the requirements for new generating facilities and for critical fuels
- Higher utilization of existing and planned generating facilities
- More efficient operation of existing and planned facilities.

Generation expansion can be delayed or eliminated and the use of critical fuels reduced by significantly reducing energy and peak consumption through the use of energy appliances, weatherization programs, and energy efficient guidelines for new construction.

Higher utilization of existing and planned generating facilities can be achieved through a program of deliberate load growth. Programs to promote the use of add-on heat pumps or to develop industrial customers are common examples. While such programs increase total costs due to higher fuel and other operating expenses, they reduce unit costs by spreading the fixed costs (debt service and dividends) over more kilowatt hours.

Improved operating efficiencies are possible by shifting the load to make greater use of more efficient generating units. Unfortunately, calculating plant operating costs and plant operating schedules is not a simple task. Thus, estimating changes in the overall system efficiency is quite time consuming.

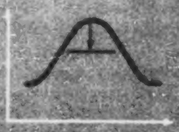
Up to this point, the discussion has focused primarily on utilities involved in both generating and distributing power. However, companies involved exclusively in either generation or distribution can also benefit from the use of demand-side management. Often the cost of purchased power contains a demand charge, which of course can be reduced directly through demand-side management alternatives. Regardless of what terms are included in the purchase agreements, the cost of purchased power depends on the cost of service which, in turn, depends on the load shape that must be served.

A number of reasons for considering demand-side management have been presented. Note, however, that *considering* demand-side management alternatives and *implementing* them are two entirely different issues. The decision to implement these alternatives requires analysis of how the load shape change will affect the operational and financial conditions of the utility. More is said in subsequent sections on the required analysis.

LOAD SHAPE OBJECTIVES*

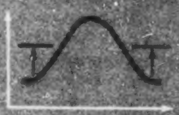
PEAK CLIPPING, or the reduction of the system peak loads, embodies one of the classic forms of load management. Peak clipping is generally considered as the reduction of peak load by using direct load control. Direct load control is most commonly practiced by direct utility control of customers' appliances. While many utilities consider this as a means to reduce peaking capacity or capacity purchases and consider control only during the most probable days of system peak, direct load control can be used to reduce operating cost and dependence on critical fuels by economic dispatch.

PEAK CLIPPING



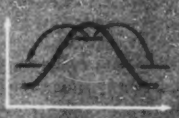
VALLEY FILLING is the second classic form of load management. Valley filling encompasses building off-peak loads. This may be particularly desirable where the long-run incremental cost is less than the average price of electricity. Adding properly priced off-peak load under those circumstances decreases the average price. Valley filling can be accomplished in several ways, one of the most popular of which is new thermal energy storage (water heating and/or space heating) that displaces loads served by fossil fuels.

VALLEY FILLING



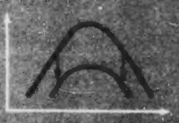
LOAD SHIFTING is the last classic form of load management. This involves shifting load from on-peak to off-peak periods. Popular applications include use of storage water heating, storage space heating, coolness storage, and customer load shifts. In this case, the load shift from storage devices involves displacing what would have been conventional appliances served by electricity.

LOAD SHIFTING



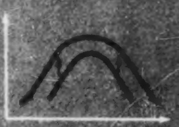
STRATEGIC CONSERVATION is the load shape change that results from utility-stimulated programs directed at end use consumption. Not normally considered load management, the change reflects a modification of the load shape involving a reduction in sales as well as a change in the pattern of use. In employing energy conservation, the utility planner must consider what conservation actions would occur naturally and then evaluate the cost-effectiveness of possible intended utility programs to accelerate or stimulate those actions. Examples include weatherization and appliance efficiency improvement.

STRATEGIC CONSERVATION



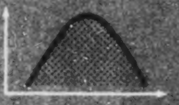
STRATEGIC LOAD GROWTH is the load shape change that refers to a general increase in sales beyond the valley filling described previously. Load growth may involve increased market share of loads that are, or can be, served by competing fuels, as well as area development. In the future, load growth may include electrification. Electrification is the term currently being employed to describe the new emerging electric technologies surrounding electric vehicles, industrial process heating, and automation. These have a potential for increasing the electric energy intensity of the U.S. industrial sector. This rise in intensity may be motivated by reduction in the use of fossil fuels and raw materials resulting in improved overall productivity.

STRATEGIC LOAD GROWTH



FLEXIBLE LOAD SHAPE is a concept related to reliability, a planning constraint. Once the anticipated load shape, including demand-side activities, is forecast over the corporate planning horizon, the power supply planner studies the final optimum supply-side options. Among the many criteria he uses is reliability. Load shape can be flexible — if customers are presented with options as to the variations in quality of service that they are willing to allow in exchange for various incentives. The programs involved can be variations of interruptible or curtailable load; concepts of pooled, integrated energy management systems; or individual customer load control devices offering service constraints.

FLEXIBLE LOAD SHAPE



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*Adapted from Clark W. Gellings, Highlights of a speech presented to the 1982 Executive Symposium of EEI Customer Service and Marketing Personnel.

2) WHAT TYPE OF DEMAND-SIDE MANAGEMENT ACTIVITIES COULD MY UTILITY BE GETTING INVOLVED IN?

Although customers and utilities can act independently to alter the pattern of demand, the concept of demand-side management implies a utility/customer relationship that produces mutually beneficial results. To achieve these mutual benefits, a utility must carefully consider such factors as the manner in which the activity will affect the utility's load shape, the methods available for obtaining customer participation, and the likely magnitudes of costs and benefits to both utility and customer prior to attempting implementation.

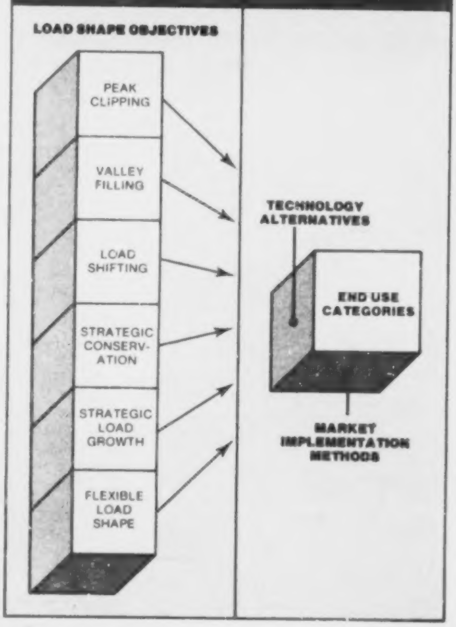
Because there are so many demand-side alternatives, the process of identifying potential candidates can be carried out more effectively by considering several aspects of the alternatives in an orderly fashion. Demand-side activities can be categorized in a two-level process in which the second level has three steps:

Level I: • Load Shape Objectives
Level II: • End Use
• Technology Alternatives
• Market Implementation Methods.

The first step in identifying demand-side alternatives is typically the selection of an appropriate load shape objective to ensure that the desired result is consistent with utility goals and constraints. For example, load forecasts may indicate that existing and planned generating capacity will fall short of projected peak demand plus targeted reserve margins by 100 megawatts within 7 to 10 years. Several supply-side alternatives may be available to meet this capacity shortfall: additional peaking capacity can be built; extra power can be purchased as needed from other generating utilities; or, perhaps a reduction in reserve margin can be tolerated. There are also a number of demand-side alternatives, including direct load control, interruptible rates, and residential thermal storage, that can augment the number of planning alternatives available to a utility. Choosing between meeting the 100 MW peak versus reducing the peak becomes a balance between the costs and benefits associated with the range of available supply-side and demand-side alternatives.

Once the load shape objective has been established, it is necessary to find ways to achieve it. This is the second level in the identification process which involves three steps or dimensions. The first dimension involves identifying the appropriate end uses whose peak load and energy consumption characteristics generally match the requirements of the load shape objectives. In general, each end use (e.g., residential space heating, commercial lighting) exhibits typical and predictable load patterns. The extent to which load pattern modification can be accommodated by a given end use is one factor used to select an end use for demand-side management.

In this report, nine major residential end uses of electricity have been selected for having the most potential for demand-side management. They are space heating, space cooling, water heating, lighting, refrigeration, cooking, laundry, swimming pools, and miscellaneous other uses. Each of these end uses provides a different set of opportunities to meet some or all of the load shape modification objectives that have been discussed. Some of the end uses can successfully serve as the focus of programs to meet any of the load shape objectives, while others can realistically be useful for meeting only one or two of these objectives. In general, space heating, space cooling, and water heating are the residential end uses with the greatest potential applicability for achieving load shape objectives. These end uses tend to be among the most energy intensive and among the most adaptable in terms of having their usage pattern altered. However, some utilities have achieved significant load shape modifications by implementing programs based on or including combinations of other end uses.


CHARACTERIZATION OF DEMAND-SIDE MANAGEMENT ALTERNATIVES

The second dimension of demand-side management alternatives involves choosing appropriate technology alternatives for each target end use. This process should consider the suitability of the technology for satisfying the load shape objective. Even though a technology is suitable for a given end use, it may not produce the desired results. For example, although water heater wraps are appropriate for reducing domestic water heating electric consumption, they are not appropriate for load shifting. In this case, an option such as direct load control via receiver/switches would be a better choice.

Residential demand-side technologies can be grouped into four general categories:

- Building envelope alternatives
- Efficient equipment and appliances
- Thermal storage equipment
- Energy and demand control options.

These four main categories cover most of the currently available, or soon to be available, residential cost control/customer options. Many of the individual options can be considered as components of an overall program and thereby offer a very broad range of possibilities for successful residential demand-side program synthesis and implementation. These options are described in greater detail in the box below.

The third dimension of demand-side management alternatives deals with various methods for encouraging the customer to participate in the program. Market implementation methods vary for different technologies. Frequently, two or more customer adoption strategies are used simultaneously to promote a given program. The different types of customer adoption techniques represent varying levels of utility involvement. Direct incentive programs, for example, represent a high degree of utility support in promoting demand-side programs. Customer awareness strategies can require less utility involvement. Customer adoption techniques are discussed further in Question #5.

Taken in sequence, the four steps of activities described provide an orderly method for characterizing demand-side management alternatives. The basic steps are:

- Establish the load shape objective to be met
- Determine which end uses can be appropriately modified to meet the load shape objective
- Select technology options that can produce the desired end use load shape changes
- Identify an appropriate market implementation program.

RESIDENTIAL DEMAND-SIDE TECHNOLOGY ALTERNATIVES

EFFICIENT EQUIPMENT AND APPLIANCE ALTERNATIVES

- **HEAT PUMPS**
  - — Ducted Air Source Heat Pump
  - — Ground-Water Source Heat Pump
  - — Ground-Coupled Heat Pump
  - — Multizone Heat Pump
  - — Room Heat Pump
- **HIGH EFFICIENCY APPLIANCES**
  - — High-EER Air Conditioner
  - — Energy-Efficient Cooking Appliances
  - — Energy-Efficient Washers and Dishwashers
  - — Energy-Efficient Refrigerators and Freezers
  - — Efficient Lighting Fixtures and Lamps
- **DUAL FUEL AND ELECTRIC HEATING**
  - — Dual Fuel Heating Systems
  - — Add-On Heat Pump
  - — Active Solar Space Heating
  - — Task Heating
  - — Zoned Resistance Heating
- **WATER HEATING EQUIPMENT**
  - — Heat Pump Water Heater
  - — Heat Recovery Water Heater
  - — Solar Water Heating

BUILDING ENVELOPE ALTERNATIVES

- **[illegible]**
  - — [illegible]
  - — [illegible]
  - — [illegible]
  - — [illegible]
- **[illegible]**
  - — [illegible]
- **[illegible]**
  - — Passive Solar Design

THERMAL STORAGE EQUIPMENT

- **HEAT STORAGE**
  - — Central Ceramic Heat Storage
  - — Room Ceramic Heat Storage
  - — Slab Heating
- **COOL STORAGE**
  - — Residential Ice Storage Air Conditioning

ENERGY AND DEMAND CONTROL EQUIPMENT

- **DIRECT UTILITY CONTROL**
  - — Receiver Switches
  - — Water Heater Cycling Control
  - — Air Conditioner Cycling Control
- **LOCAL UTILITY OR CUSTOMER CONTROL**
  - — Variable [illegible]-Load Devices
  - — Timers
  - — Appliance Interlocks
  - — Programmable Thermostats
  - — [illegible]
  - — [illegible]
  - — [illegible]

3) HOW DO I SELECT THOSE ALTERNATIVES THAT ARE MOST BENEFICIAL FOR MY UTILITY?

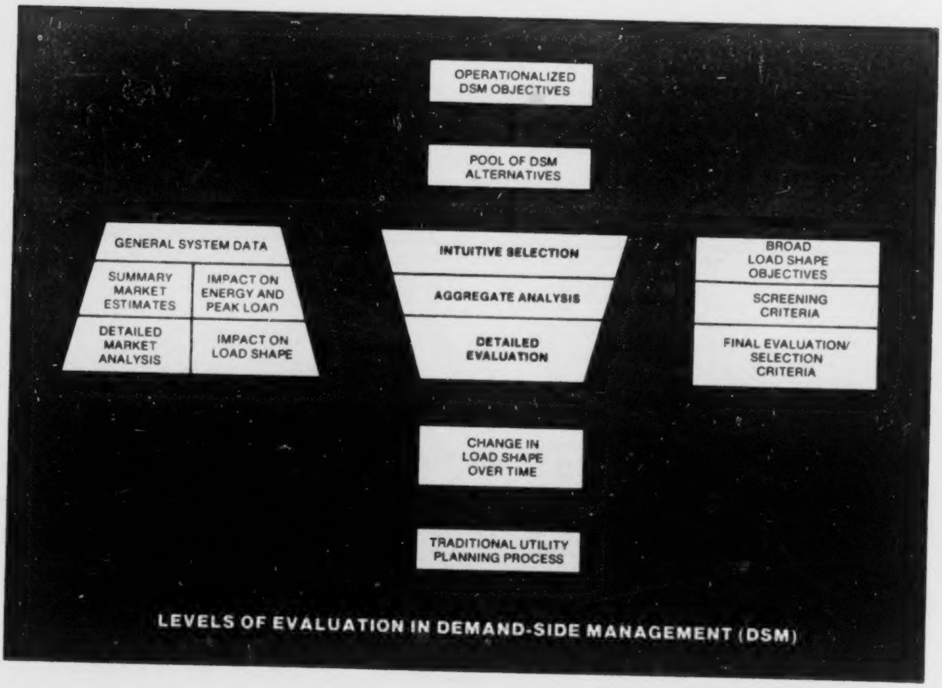
Selection of the most appropriate demand-side management alternatives is perhaps the most crucial question a utility faces. The question is difficult since the number of demand-side alternatives from which to select is so large. In addition, because the relative attractiveness of alternatives depends upon specific utility characteristics, such as load shape, summer and winter peaks, generation mix, customer mix, and load growth, transfer of results from one service area to another may not be appropriate. In other words, what is attractive to one utility may not be attractive to another.

Completing detailed evaluations of demand-side programs can be complex and may even appear overwhelming. These evaluations typically require a great deal of data and a computer model for processing. However, a detailed analysis of demand-side alternatives is *not* the starting point in the selection process.

Levels of Analysis

Because there are so many different demand-side alternatives available to a utility, they should be analyzed through a hierarchy of evaluation levels, starting with an intuitive selection, continuing with an aggregate analysis, and ending with a detailed and comprehensive evaluation. To a large extent, the appropriate level of analysis depends upon the importance of the decision that will be influenced by the analysis. In the hierarchy, quick and less demanding analysis is used to identify the most attractive candidates for more extensive analysis. However, the utility analyst must ensure that the potential value of additional, more detailed analysis is not outweighed by the costs of completing the detailed analysis. An example of each evaluation level is provided in the later section, "Overview of Volume II".

Although every utility does not need to go through all three levels of analysis or even the final level in selecting an alternative, the starting point should be an intuitive


OPERATIONALIZED DSM OBJECTIVES
POOL OF DSM ALTERNATIVES
GENERAL SYSTEM DATA
SUMMARY MARKET ESTIMATES
IMPACT ON ENERGY AND PEAK LOAD
DETAILED MARKET ANALYSIS
IMPACT ON LOAD SHAPE
INTUITIVE SELECTION
AGGREGATE ANALYSIS
DETAILED EVALUATION
BROAD LOAD SHAPE OBJECTIVES
SCREENING CRITERIA
FINAL EVALUATION/ SELECTION CRITERIA
CHANGE IN LOAD SHAPE OVER TIME
TRADITIONAL UTILITY PLANNING PROCESS

LEVELS OF EVALUATION IN DEMAND-SIDE MANAGEMENT (DSM) selection of those alternatives that, without extensive analysis, seem to satisfy the utility's needs. For example, a utility concerned about its summer peak and low load factor could be investigating heat pumps to build winter loads or cycling of air conditioners to reduce the summer peak growth. Options such as weatherization or thermal storage would be of lesser interest.

The first level, intuitive selection, is based upon a thorough understanding of the conditions within the service area, of the generating system and its planned expansion, and of the operating characteristics of the demand-side alternatives. Note that the intuitive selection process does not identify those alternatives that are in some sense "best" for the service area. Rather, the process identifies a number of alternatives that are, at least initially, appropriate to achieve stated goals.

The next level in identifying alternatives is a more quantitative analysis that examines costs and benefits to all parties affected by implementation of a specific program. Interested parties include the utility, the participants in the program, other customers, and often society-at-large. To calculate the costs and benefits requires quantitative information on the impact of the alternative on peak and total energy sales, the expected participation in the program, the costs of implementation, and generating system data (such as costs for existing and planned capacity and fuel costs for base and peaking units). For this level of analysis, all expected costs and benefits to the utility, the program participants, and the public-at-large are projected for the entire life of the program. Comparison of the benefit/cost ratios will then yield preliminary ranking of programs. More detailed rankings can be made of combined programs.

The final step in the selection of the most appropriate demand-side management alternative is a detailed analysis of the most cost effective alternatives. In a typical detailed analysis, the performance of the utility system from both an operational and a financial viewpoint is simulated over time, with and without the selected demand-side management alternative. This analysis estimates changes in the generating system and its operation that will result from the altered load shape produced by the selected demand-side alternatives. It builds heavily on the utility's existing capacity expansion analysis tools and corporate models.

General Information Requirements

Such analysis requires a great deal of information on the existing and planned generating system and on the demand-side program. While the information describing the current and planned generating system and its operation is generally available from capacity expansion and production costing analyses, obtaining the information for demand-side programs is often a challenge. Specifically, information on the load shape of the end use and changes in that load shape resulting from the implementation of the selected demand-side alternative is required. In addition, it is necessary to characterize the end use in the service area. In the case of space heating, this implies accumulating information on the number of electric space heating customers, the annual heating requirements, the type of equipment (e.g., electric furnace, resistance baseboard heat, or heat pump), and likely future changes in heating requirements. Finally, projections of customer acceptance and response to the program, taking into account customers' costs and savings, must be developed for the planning horizon. Since much of the information needed is related to the customer, marketing departments can play a major role in gathering it.

Implicit in the selection process is a definite strategy to reduce the information requirements to manageable levels consistent with the trade-off between the data collection/analysis expense and the resulting level of accuracy in the evaluation. This strategy focuses on quickly and efficiently reducing the number of alternatives appropriate for a given utility. Although the detailed analysis is the most comprehensive and in some sense the most "accurate" assessment, the amount of information and effort required to conduct a detailed analysis prohibits its use on all potential alternatives.

Thus, the selection process starts with utility personnel selecting those alternatives that seem most appropriate based upon insight into their service area. Technical information helpful in this selection is presented in Volumes II and III of this series. Since demand-side alternatives focus on the customer, or more correctly on a customer's end uses, customer-related background information is essential in this first step. The next step, the preliminary cost/benefit analysis, requires more quantitative information but for only those alternatives that have some promise for the service area. Finally, the comprehensive analysis is applied only to those alternatives that have the highest benefit-to-cost ratios.

The remainder of this discussion focuses on a number of important concerns in the evaluation process.

[illegible]

System Context

Demand-side management alternatives must be evaluated in the context of the supply system. Just as in the analysis of supply-side alternatives, the attractiveness of alternatives depends upon the existing and planned supply system and on the characteristics of the alternatives themselves. Demand-side alternatives alter the load shape and thus affect the operating efficiency and future capacity additions. Translating these effects into specific cost savings depends upon the characteristics of the supply system.

Transferability

Caution must be exercised in transferring results of a selection process from one service area to another. While the analysis techniques, and in some cases data, can be transferred, in most cases, the results cannot. There are a number of reasons for this. First, cost savings resulting from the implementation of demand-side alternatives depend upon the utility's load shape and the generating system it has been designed to serve. Most often, this is a unique combination. Second, customer end use characteristics often differ between service areas. For example, electric space heating and electric water heating saturation levels are often quite different, even for utilities in the same general geographic area. Thus, while the impact of an alternative may be the same on a per unit basis, the total impact resulting from the same saturation will be quite different. Customer characteristics and climatic conditions also influence the impacts on a per unit or per customer basis. Energy savings resulting from weatherization programs change, depending upon dwelling type (e.g. single family vs. multi-family), dwelling size, and climatic conditions measured (e.g., by heating degree days).

Data Requirements

Detailed analyses of demand-side management alternatives are data intensive, requiring information in four major categories:

- Service area specific customer and end use characteristics (type of equipment in use, stock estimates of this equipment, patterns of usage)
- Operating/technical characteristics of the alternatives
- Characteristics of the supply system (operating costs, reliability, initial cost)
- Customer acceptance of alternatives.

It is often said that demand-side planning data tend to be "softer" and much more customer oriented than supply-side data. Because supply-side data tend to be much more hardware and engineering oriented, they give the impression of greater reliability. However, since supply-side planning is based on projected future energy requirements (i.e., customer demands), it actually involves the same uncertainties. Moreover, critical variables in supply-side planning are often known with no more accuracy than demand-side variables.

Cost/Benefit Analysis

The cost/benefit evaluation approach is preferred by many to assess demand-side management alternatives. Although analysts typically minimize future revenue requirements in evaluating supply-side alternatives, this measure is inappropriate for evaluating some demand-side alternatives. For example, a program designed to build off-peak use of electricity, such as an add-on heat pump program, will increase revenue requirements. However, increased utilization of existing capacity will lower the unit cost of power—clearly a benefit to both the customers and the utility. Regardless of whether the analysis uses required revenues or unit costs as the measure of program impact, the costs and benefits of serving the load shape, with or without the demand-side alternative in place, must be estimated and compared over the planning horizon. In this comparison, it is important to perform the analysis on an equivalent unit basis. Thus, two systems are assumed to be equivalent if they serve the load at the same level of reliability. For utilities with excess reserves attempting to build load, it is appropriate to perform the analysis on the desired reserve level. In cases where the reserve levels are not equal, some estimates for the cost of outages must be included in the analysis.

Non-Monetary Benefits and Costs

Factors other than easily quantified monetary benefits and costs are often important in the selection of demand-side management alternatives. Although the discussion has dwelt upon savings in monetary costs up to this point, there are other important factors influencing the selection of these alternatives. Among these are:

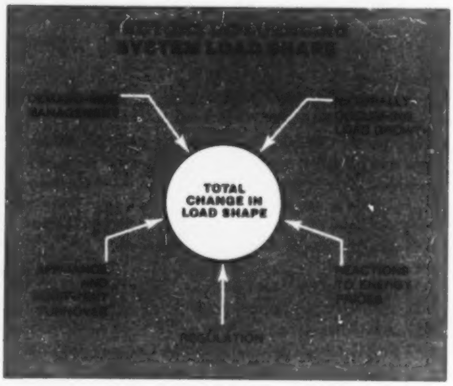
- Cash flow
- Magnitude of start-up
- Public relations reaction
- Compatibility of alternatives
- Uncertainty/risk associated with success of program
- Availability of competent installation/products
- Customer reaction/participation
- Real or perceived customer health/safety issues
- Ease/convenience of service installation
- Conformance to building codes and standards
- Regulatory/institutional limitations and opportunities.

Because such variables are difficult to quantify, they are typically not included in a formal quantitative analysis. Instead, they are incorporated qualitatively in the summary assessment of the proposed program.

4) WHAT CHANGES IN THE LOAD SHAPE CAN MY UTILITY EXPECT BY IMPLEMENTING DEMAND-SIDE ALTERNATIVES?

As outlined in the introduction, demand-side management focuses on deliberately changing the load shape so it can be served more efficiently. This focus may give the impression that the only load shape changes that occur are those induced by demand-side management. Certainly this is not the case. System load shape changes can occur naturally due to fluctuations in customer mix, the entry of new industries into the marketplace, the introduction of new processes, and the growth of end use stock in the residential and commercial sectors. Thus, to examine the impact of demand-side alternatives, it is important to differentiate naturally occurring changes in the load shape and those changes resulting from demand-side alternatives.

Customers purchase electricity to satisfy a need for energy, not to meet utility demand growth. The residential load shapes are influenced by the customer's decision to purchase an appliance, as well as the resulting level of use of that appliance. Similarly, in the commercial and industrial sectors, installation of equipment and its utilization affect the load shape. Projections of the purchase of appliances and the behavior of customers combine to produce a forecast of the residential load shape. Numerous factors influence both the selection and utilization decision, including:


SYSTEM LOAD SHAPE
DEMAND-SIDE MANAGEMENT
NATURALLY OCCURRING LOAD GROWTH
TOTAL CHANGE IN LOAD SHAPE
APPLIANCE AND EQUIPMENT TURNOVER
REACTIONS TO ENERGY PRICES
REGULATION

- Price of electricity and competing fuels
- Demographics (income, age, and education)
- Appliance characteristics (saturation, usage, cost, and age)
- Behavioral factors
- Utility marketing/program availability
- Mandated standards.

The action taken by consumers once an appliance or device has been purchased and installed, combined with the design characteristics of the device, results in the load shape change or the customer response.

The same basic mechanism used to describe the load shape and its change over time can also be used to estimate changes in that load shape due to demand-side management. Changes in an individual customer's load shape result from two different factors:

- Changes in customer utilization of existing appliances or equipment (e.g., installation of clock thermostat setback in response to an advertising campaign or conservation)
- Changes in the operating characteristics or technology for a given end use (e.g., substitution of a heat pump for an electric furnace).

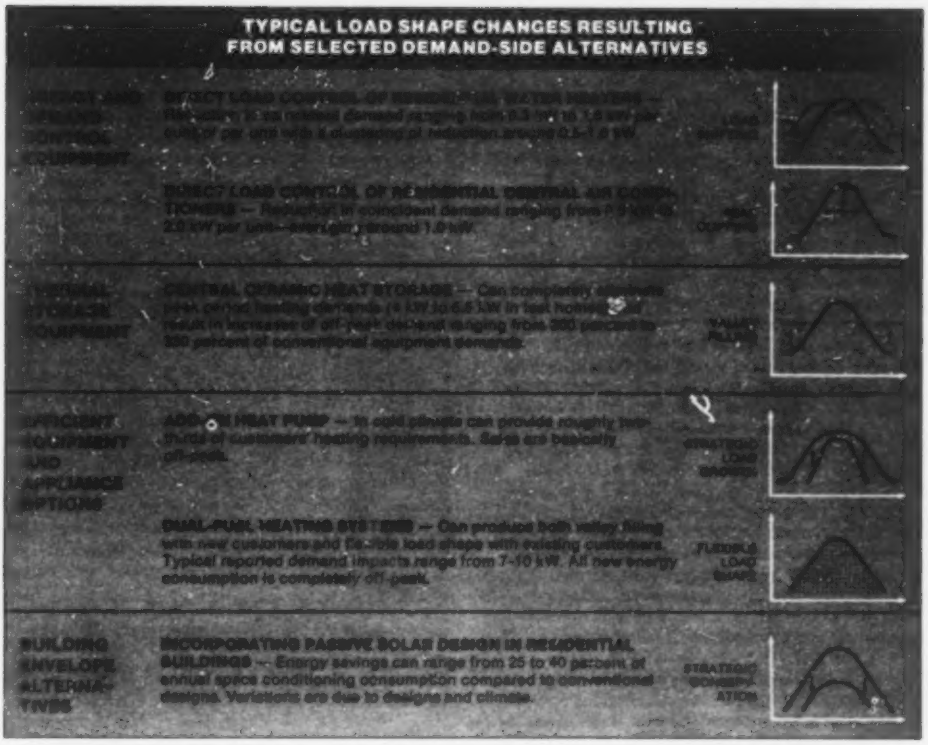
Obviously, these factors are not mutually exclusive and often interact. System load shape changes are the cumulative response of individual customer load shape changes plus the load contributed by new customers.

While both of the above factors produce changes in the load shape, it is important to differentiate the effects of each. In the case of behaviorally induced changes, the emphasis is on how the customer responds and how permanent that response is. Since in many cases there is no customer investment, the changes may only be temporary, with customers eventually reverting back to their original behavior patterns.

The technology-induced changes in the load shape depend upon the relative usage level of the device, as well as its improved design characteristics. As such, the changes in the load shape tend to be "permanent" and more predictable. Returning to the heat pump example, the load shape may still change as the customer becomes more energy conscious. However, these changes are limited when compared to the change resulting from the improved operating characteristics of the heat pump. The critical question remains—what is the level of customer acceptance of the device? Acceptance of demand-side alternatives is discussed in more detail later.

Load shape changes that can be expected from the implementation of demand-side alternatives vary. This should not be surprising since factors unique to the service area influence changes in the system load shape. To provide the reader with some ranges of the changes that can be achieved, the chart on page 21 provides a number of examples.

The remainder of the discussion in this section focuses on two critical issues related to load shape impacts: program interaction and dynamic load shapes.



TYPICAL LOAD SHAPE CHANGES RESULTING FROM SELECTED DEMAND-SIDE ALTERNATIVES

[illegible] CONTROL EQUIPMENT	**DIRECT LOAD CONTROL OF RESIDENTIAL WATER HEATERS** — Reduction in coincident demand ranging from 0.3 kW to 1.6 kW per unit of per unit with a clustering of reduction around 0.5-1.0 kW	LOAD SHIFTING
	DIRECT LOAD CONTROL OF RESIDENTIAL CENTRAL AIR CONDITIONERS — Reduction in coincident demand ranging from 0.5 kW to 2.0 kW per unit—averaging around 1.0 kW.	PEAK CLIPPING
THERMAL STORAGE EQUIPMENT	**CENTRAL CERAMIC HEAT STORAGE** — Can completely eliminate peak period heating demands (4 kW to 6.5 kW in test homes) and result in increases of off-peak demand ranging from 200 percent to 300 percent of conventional equipment demands.	VALLEY FILLING
EFFICIENT EQUIPMENT AND APPLIANCE OPTIONS	**ADD-ON HEAT PUMP** — In cold climate can provide roughly two-thirds of customers' heating requirements. Sales are basically off-peak.	STRATEGIC LOAD GROWTH
	DUAL-FUEL HEATING SYSTEMS — Can produce both valley filling with new customers and flexible load shape with existing customers. Typical reported demand impacts range from 7-10 kW. All new energy consumption is completely off-peak.	FLEXIBLE LOAD SHAPE
BUILDING ENVELOPE ALTERNATIVES	**INCORPORATING PASSIVE SOLAR DESIGN IN RESIDENTIAL BUILDINGS** — Energy savings can range from 25 to 40 percent of annual space conditioning consumption compared to conventional designs. Variations are due to designs and climate.	STRATEGIC CONSERVATION

Program Interaction

Alternatives tend to interact making the estimation of changes in the load shape difficult. Demand-side alternatives are often promoted and implemented as an integrated program. Promotion of heat pumps not only affects heating requirements, but also cooling loads. Moreover, if the heat pump program is coupled to a weatherization program, energy requirements are lowered for those customers participating in both programs. Similarly, there may be changes resulting from cycling air conditioners that can be influenced by the use of a "smart" thermostat. This kind of thermostat "knows" the future power interruption and automatically lowers the indoor temperature in anticipation of expected reduced air conditioner operation. Interactions of alternatives must be carefully examined and their implications analyzed.

Dynamic Load Shapes

Load shape impacts of demand-side alternatives may change over the planning horizon. Just as the system load shape is dynamic and is expected to change over time, so are the load impacts of many demand-side alternatives. Failure to recognize and account for this can lead to serious future supply problems. For example, the amount of control that can be exercised over the cooling load using direct load control will change over the course of the planning horizon. For many utilities, the stock of central air conditioners is still growing due to increasing saturation levels and/or customer growth. Therefore, assuming the same level of participation in the program, the total amount of control tends to increase. On the other hand, customers are replacing old and inefficient units with much more energy efficient ones. Assuming the same amount of control, these efficiency improvements would tend to decrease the impact of the load control interruptions. The net effect of these opposing trends depends on the specific conditions present in the service area. The important message, however, is that the load shape is dynamic and changes over the planning horizon.

5) HOW CAN MY UTILITY FORECAST AND PROMOTE CUSTOMER ADOPTION OF DEMAND-SIDE ALTERNATIVES?

For many years, utility marketing departments successfully stimulated company growth by directing numerous advertising and sales efforts such as the "Live Better Electrically" program conducted in cooperation with appliance manufacturers. But, as electricity costs accelerated and national targets for utility use of petroleum and natural gas were set, supply-side issues took on a greater importance. During the 1970s, many of the utility marketing efforts were dismantled and the marketing staff dispersed to other departments. It has only recently been recognized nationally that marketing can be used to shape load as well as to stimulate it. Marketing departments can make valuable contributions to developing demand-side solutions to load problems *and* to taking advantage of load opportunities. Thus, one of the first and most fundamental issues to be addressed in the development of marketing programs is to locate and pull together the expertise and tools necessary to identify, evaluate, and implement successful marketing programs.

It is an old adage that "nothing happens until someone sells something." In the demand-side management context, this means that even if the best analysis techniques have been applied, data collected, and technology developed, the success of demand-side management often hinges on the ability to persuade customers to actively participate in the program.

It is important for utilities to understand how these decisions are reached. Customers do not purchase energy for the sake of consuming it, per se, but instead are interested in the service it provides. That service brings warmth, cooling, artificial illumination, motive power, or other conveniences.

As discussed in the previous section, potential customer interest in a demand management program may be based on a number of factors including:

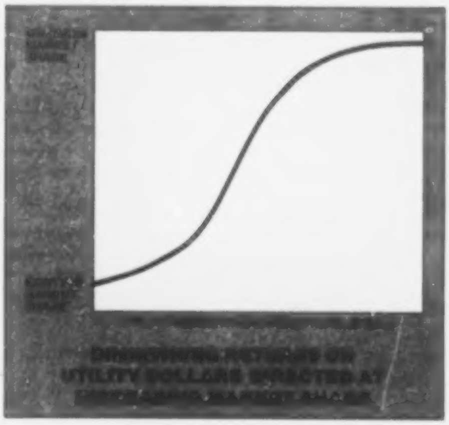
- Price of electricity and competing fuels
- Demographics (income, age, and education)
- Appliance characteristics (saturation, usage, cost, and age)
- Behavioral factors
- Utility marketing/program availability
- Mandated standards.

Utilities must also be sensitive to the fact that the stage a consumer has reached in adopting a new product or service has a bearing on the type of marketing that should take place.

The goal of the utility program and its associated marketing effort is often to increase the purchase of demand management options. It is important for utilities to know the current market penetration of certain demand management devices in their service territories. If market penetration is deemed too low, a number of options are worth considering. The utility may:

- Attempt to expand the number of people comprising the target market
- Enlarge the number of devices covered in a program to approach the total market potential
- Increase or modify advertising/promotional efforts to encourage greater response from the existing market.

Caution should be used, however, in setting goals near the upper limit of market potential due to the possible diminishing returns of marketing expenditures over time. The concept of "optimal market share" can be explored if the utility can quantify the benefits associated with alternative market share levels.



Estimating Future Market Demand and Customer Participation Rates

Projections of future market demand depend on a large number of factors, including:

- Availability, frequency, timing, and use of programs and promotions
- State of the economy
- Seasonality
- Value of program incentives.

Market demand can be projected by several methods, including:

- Buyer intention surveys
- Middleman estimates
- Market tests
- Time series analysis
- Statistical demand analysis.

Buyer intention surveys solicit buying intentions for an upcoming period from a sample of target consumers. However, buyers having less clear intentions and those unwilling to report their intentions affect the reliability of results. Simple "yes—no" questions can be asked or a "full purchase probability scale," which is similar to a Likert Scale in refining customer responses, may be used.

Middleman estimates consist of information supplied by dealers, sales personnel, and field representatives regarding equipment sold and devices placed into the field.

Market tests/pilot programs are particularly appealing where a new product or service is planned and other forms of measurement are not appropriate. Where there is no prior experience with a program, pilot programs are developed and implemented to either a small part of a utility's service territory or informally offered to customers as part of another program in order to measure and evaluate customer response.

Time series analyses rely on historical buyer data to estimate future consumptive decisions. A number of components of historical information are often analyzed, including trends, cycles, and seasons. Some utilities use this technique for operational programs that have stable customer response rates.

Statistical demand analyses include additional variables that may either co-vary or cause a change in the effect of product and service requests. Price, income, population, construction starts, and household formation are the types of variables used. Sales, audits, installations, etc., are viewed as a dependent variable and price, households, etc., are the independent variables.

Consumer and Market Research*

Secondary and/or primary market data are collected and analyzed as inputs to the market analysis methodologies. Regardless of the type of research data selected, the estimator of market penetration must consider these factors:

- The accuracy of the data and its relevance to the estimating task at hand
- The cost (time and money) to collect and analyze the data
- The accuracy of the resulting estimate.

Primary data are collected to answer specific marketing or estimating needs. Primary data collection is usually categorized in two ways: qualitative and quantitative research. Frequently, qualitative research provides the foundation for quantitative research by clarifying relevant concepts and developing research hypotheses.

The two most common forms of qualitative research are in-depth interviews and focus group discussions. Both techniques are used to explore issues, identify motivations and behavior, and develop an understanding of the consumer.

Quantitative research can be further subdivided into observational techniques, experimentation, and surveys. Observational techniques include a variety of unobtrusive measures, for example, utility metering of electrical use. Certain archival records generated by utilities and other end-use technology related industries might also be classified as observational. Experimentation includes test marketing, concept testing, and a variety of other relatively powerful techniques designed to establish causality. The concept of control groups is central to experimentation. Surveys can provide data on socioeconomic characteristics, attitudes, behavior, and buying intentions. The information can be used to estimate market potential, to forecast sales, or to analyze consumer preferences.

Secondary sources include data collected for some purpose other than estimating. For example, the U.S. Department of Commerce, Bureau of Census, collects data on population and housing that can be used to estimate the penetration of central air conditioning in residential buildings. A further delineation of secondary data research concerns the source—internal or external. Internal secondary data include proprietary price and sales records. External data are usually defined as published information.

The use of secondary data in estimating market penetration has advantages and disadvantages. These data usually do not answer the precise estimating needs and there may be problems associated with the way the data were originally collected or are presented. On the other hand, secondary data are easily available, usually less expensive, and can serve to define the phenomenon.

Customer Adoption Techniques

The utility executive has a number of market implementation methods from which to choose. Most of these program options fall into one of the following categories:

- Alternative pricing (rate structures)
- Direct incentives
- Customer education
- Direct customer contact
- Trade ally cooperation
- Advertising and promotion.

The table on the next page presents a number of specific program options within these categories. This list will be augmented and more fully described in later volumes of the "EEI Bookshelf Series" and in a recently funded study at EPRI on "Alternative Rate Structures" (RP 2440).

Many of these alternatives have been used successfully in the past. The selection of the incentives typically depends on a utility's prior experience with similar programs, the receptivity of state regulatory authorities, and the organizational philosophy of the utility.

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*Adapted from Resource Planning Associates, Inc., *Methods for Analyzing the Market Penetration of End Use Technologies: A Guide for Utility Planners*, published by the Electric Power Research Institute, October 1982, EPRI EA 2702 (RP 2045-2). EPRI has also recently funded a project on "Identifying Consumer Research Techniques for Electric Utilities" (RP 1537).

EXAMPLES OF CUSTOMER ADOPTION TECHNIQUES

CUSTOMER ADOPTION TECHNIQUE	OBJECTIVE	SPECIFIC ALTERNATIVES
Customer Education	Increase customer awareness of utility programs.	Bill inserts, brochures, information packets, displays, clearinghouses, direct mailings.
Direct Customer Contact	Through face-to-face communication encourage greater customer response to utility programs.	On-site energy service audits, workshops/energy clinics, store fronts/vendor sales and service.
Trade Ally Cooperation (i.e., architects, engineers, appliance dealers, heating, cooling contractors)	Increase utility capability in marketing and implementing programs.	Cooperative advertising and marketing, training, certification, selected product sales/service.
Advertising and Promotion	Increase public awareness of new programs to influence and control customer response.	Mass media (radio, TV, and newspaper), point-of-purchase advertising.
Alternative Pricing	Provide customers with pricing signals that are reflective of real economic costs and encourage a desired market response.	• Demand rates—rates based on the maximum kilowatt usage of a customer; the rates thus provide an incentive for customers to improve their load factor. • Time-of-use rates—rates where higher costs are incurred by the customer for using during a utility's peak period and lower costs during off-peak periods. • Off-peak rates—rates priced to reflect lower off-peak costs which offer customer service for specific end uses such as storage heating or storage water heating. • Seasonal rates—rates where the season in which the utility reaches its peak has a higher flat rate than other seasons. • Inverted rates—rates where consumers pay more for each unit of electric consumed in later tail blocks. The first block may or may not consist of a lifeline rate. • Variable levels of service—rates where customers subscribe to a minimum electric service consistent with their needs—e.g., interruptible rates. • Promotional rates—rates designed to attract targeted groups of customers to a utility service area for the purpose of encouraging economic development. • Conservation rates—reduced rates based on a customer's dwelling meeting minimum energy efficiency standards, including mechanical systems.
Direct Incentives	Reduce up-front purchase price and risk of hardware-related technologies to the customer and increase speed of market penetration.	• Low/no interest loans—loans issued to customers below the current lending rate with the length of time for repayment varying. • Cash Grants/Rebates/Buy Back—money paid to customers based on some criteria, usually the efficiency of the device, energy/demand saved, and difference in utility average and marginal costs. • Subsidized installation/modification—utility arranges to have a specific measure installed for a reduced

6) WHAT IS THE BEST WAY FOR MY UTILITY TO IMPLEMENT SELECTED DEMAND-SIDE PROGRAMS?

More than 1,000 separate demand-side projects are under way across the nation.* However, many of the current programs being implemented are either "pilot" programs or larger efforts that are at a preliminary stage. Only a limited amount of information has been compiled on major program implementation experiences.

In this overview, program implementation refers to carrying out demand side programs after their cost-effectiveness has been determined during the demand-side program planning and evaluation phase (the activities described in Question #3). Program implementation involves the many detailed day-to-day decisions that must be made to realize the goals of demand-side management programs. Monitoring demand-side programs is considered a separate activity and is discussed in Question #7.

Program Implementation Issues

Implementing demand-side programs involves three major considerations:

- Program planning
- Program management
- Program logistics.

Program Planning

As with any sophisticated program, a demand-side program should begin with an implementation plan. The plan includes a set of carefully defined, measurable, and obtainable goals. A program logic chart can be used to identify the program implementation process from the point of customer response to program completion. For example, in a direct load control program, decision points, such as meeting customer eligibility requirements, completing credit applications, device installation, and post-inspection can be defined. Actual program implementation can be checked against the plan and major variances reviewed as they occur.

The careful planning that characterizes other utility operations should carry over to the implementation of demand side programs. The programs are expensive and prudent planning will help assure program efficiency and effectiveness. The variety of activities and functional groups involved in implementing demand-side programs further accentuates the need for proper planning.

Program Management

The implementation process involves many different functional groups or departments within the utility. Careful management is required to ensure efficient implementation. The chart on page 26 indicates the span of effort and a sample of possible functional responsibilities in a direct load control demand-side implementation. Managing such widespread activities requires a complete understanding and consensus of program objectives and clear lines of functional authority and accountability.

Ongoing program management is also extremely important. The need for cost accounting, monitoring employee productivity and quality assurance should be addressed; the use of direct incentives necessitate close monitoring of program costs. For whatever reason, if periodic status reports are required, the requisite input data and the reporting of key performance indicators must be carefully included.

Program Logistics

Program support includes staffing, equipment, facilities, and training requirements. A program implementation manual is a useful tool to provide program personnel with necessary policy and procedure guidelines. The sample list of functional responsibilities in an implementation program gives an indication of the activities that may be included in such a manual.

A customer adoption plan that coordinates the use of mass media and other advertising and promotional activities (such as bill inserts and direct mail) should be carefully integrated into the implementation program. It is always important to establish good rapport with customers, even more so now, because the industry is entering a new era—the era of providing energy services. This requires closer interaction with customers, and good rapport is necessary regardless of the demand-side program. Effective marketing and public education campaigns, as well as quick response to customer concerns, will help achieve this goal. Customer concerns should be addressed at all levels of program design and implementation.

Many demand-side management programs include installing a specific piece of equipment or hardware that will alter customer energy use to benefit both the customer and the utility. In this report, such equipment has been termed "technology alternatives" to contrast it with the other three dimensions or aspects of demand-side

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*Much of the material presented in this section is adapted from:

Linda Finley, "Load Management Implementation Issues", December, 1982, presentation made at the EPRI Seminar on "Planning and Assessment of Load Management."

Synergic Resources Corporation, *Electric Utility Sponsored Conservation Programs: An Assessment of Implementation Mechanisms* (forthcoming). Electric Power Research Institute, RP 2050-11.

Energy Management Associates, Inc., *Issues in Implementing a Load Management Program for Direct Load Control*, March 1983. Published by the Electric Power Research Institute, Report No. EPRI EA 2904 (RP 2050-8).

Energy Utilization Systems, Inc., *1981 Survey of Utility Load Management, Conservation, and Solar End-Use Projects*, November 1982. Published by Electric Power Research Institute, Report No. EM 2649 (RP 1940-1).

SAMPLE FUNCTIONAL RESPONSIBILITIES IN MARKETING PROGRAM IMPLEMENTATION

FUNCTION AREA	KEY RESPONSIBILITIES
CEO/Senior Management	• Decision to implement demand-side management plan • Approve program budgets and large-scale purchases and rate designs
Demand-Side Management Committee	• Mobilize and manage staff team • Address customer needs
Rates	• Design rate incentives for pilot and full-scale programs • Obtain PSC approvals
Finance Planning and Billing	• Develop program budgets • Modify billing software
Distribution Planning	• Assess program impacts on distribution system
Transmission/Bulk Power Planning	• Assess program impacts on transmission system
Generation/Resource Planning	• Assess program impacts on generation system
System Operation	• Develop specs for any energy management systems (EMS) that may be needed • Operate EMS system
Substation/Distribution Engineering	• Develop specs for pilot and large-scale distribution supervisory system that may be needed • Operate the distribution supervisory system
Customer and Public Relations	• Design PR programs for recruiting customers for pilot and large-scale programs • Provide interface between customer and utility
Load Research/Economics and Statistics/Load Forecasting	• Monitor load research data and program performance
Purchasing	• Negotiate contracts and monitor delivery of equipment for pilot and large-scale programs
Installation/Construction/Engineering	• Train staff on installations, maintenance, and metering of equipment • Schedule customer installation • Schedule repair and maintenance
Regulatory/Legal Affairs	• Analyze potential program liability • Negotiate contractual matters

alternatives—the intended program objective, the affected end use, and the selected customer adoption technique or marketing strategy.

Some of these technology alternatives are installed, used, or marketed by the utility as part of the demand-side program. The special issues related to such demand-side programs involving utility-owned and installed equipment include: selecting the proper equipment or hardware, establishing an appropriate customer adoption program, developing quality assurance programs, and developing an installation and maintenance schedule.

Selecting the Proper Equipment or Hardware. Utilities need to evaluate a variety of conflicting factors if they are specifying the functional requirements for equipment or hardware. The specifications for any new equipment must be coordinated with existing customer and utility hardware. In the equipment selection process, changes in demand-side technology (such as improvements in the efficiencies of space heating and cooling equipment) and evolving utility needs (such as automation of the utility's distribution system) should be evaluated. Utilities need also to identify the safeguards that will ensure proper equipment use.

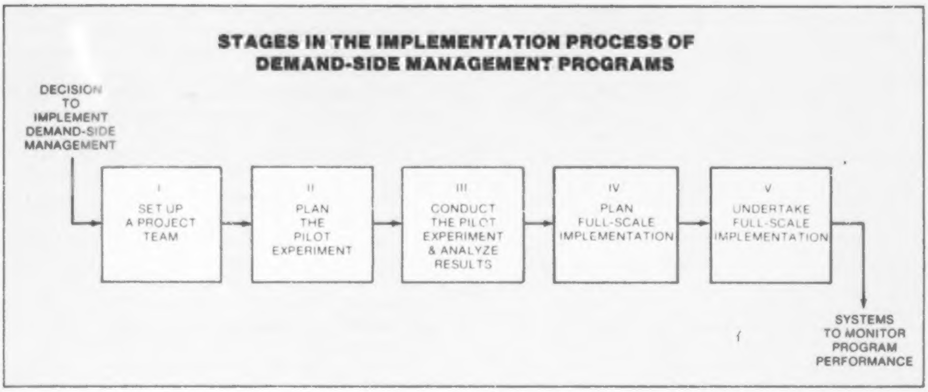
Establishing an Appropriate Implementation Program. Some utility marketing programs are better suited to promote the installation of certain demand-side technology alternatives. In most cases, a mix of implementation techniques will be used. The selected implementation marketing measures should be compatible with any technology alternative that is part of the demand-side program.

Identifying Quality Assurance Considerations. Because of the possible large number of dispersed devices, utilities can improve customer and utility system performance by considering quality assurance in the implementation program. In the example of a direct load control program, failures may be attributed either to malfunctions of the devices or to the communication links.

Developing an Installation and Maintenance Schedule. Many expenses are involved in the installation, maintenance, and repair of the numerous utility-owned and operated devices that are included in a utility's demand-side program. Utilities can reduce operating costs by developing prudent scheduling policies for their limited crew resources. Efficient scheduling of equipment ordering and installation is helpful in reducing unnecessary program delays.

The Implementation Process

Developing, installing, and operating a generating plant—that is, all the steps associated with "implementing" a supply-side program—takes years of planning and scheduling, rigorous analytic modeling, calculations concerning reliability and maintenance, and strict construction scheduling. An equally rigorous approach is needed to implement the demand-side alternatives. There are many


STAGES IN THE IMPLEMENTATION PROCESS OF DEMAND-SIDE MANAGEMENT PROGRAMS

DECISION TO IMPLEMENT DEMAND-SIDE MANAGEMENT
I SET UP A PROJECT TEAM
II PLAN THE PILOT EXPERIMENT
III CONDUCT THE PILOT EXPERIMENT & ANALYZE RESULTS
IV PLAN FULL-SCALE IMPLEMENTATION
V UNDERTAKE FULL-SCALE IMPLEMENTATION
SYSTEMS TO MONITOR PROGRAM PERFORMANCE

utility and nonutility actors involved in the implementation process and this requires the careful coordination of all parties.

The implementation process takes place in several stages. The stages may include forming an implementation project team, completing a pilot experiment and demonstration, and, finally, expanding to system-wide implementation. This "time-phased" process tends to reduce the magnitude of the implementation problem because pilot programs can be used to resolve program problems before system-wide implementation takes place.

Implementing demand-side programs involves almost every functional department within a utility, and careful coordination is required. As a first step, utilities may want to create a high-level, demand-side management project team with representation from the various departments, and with the overall control and responsibility for the implementation process. It is important for utility management to establish clear directives for the project team, including a written scope of responsibility, project team goals and time frame.

When limited information is available on prior utility demand-side program experiences, a pilot experiment may precede the program. Pilot experiments can be a useful interim step toward making a decision to undertake a major program. Pilot experiments may be limited either to a subregion or to a sample of customers throughout a service territory. If the pilot experiment proves cost-effective, then the utility may consider initiating the full-scale program.

After the pilot experiment is completed, additional effort must be given to refining the training, staffing, marketing, and program administration requirements. Whether or not the full-scale implementation program is carried out according to plan is assessed in the evaluation and monitoring phase described in Question #7.

7) HOW SHOULD MY UTILITY MONITOR AND EVALUATE THE PERFORMANCE OF DEMAND-SIDE MANAGEMENT PROGRAMS?

Just as there is need to monitor the performance of supply-side alternatives, there is a need to monitor demand-side alternatives.* The ultimate goal of the monitoring program is to identify deviations from expected performance and to improve both existing and planned demand-side programs. Monitoring and evaluation programs can also serve as a primary source of information on customer behavior and utility system impacts, foster advanced planning and organization within a demand-side program, and provide management with the means of examining demand side programs as they develop.

In monitoring the performance of utility demand-side programs, two questions need to be addressed:

- Was the program implemented as planned?
- Did the program achieve its objectives?

The first question may be fairly easy to answer once a routine monitoring system has been adopted. Tracking and review of program costs, customer acceptance, and scheduled milestones can help determine whether the demand-side management program has been implemented as planned.

The second question can be much more difficult to answer. As noted previously, demand-side program objectives can be best characterized in terms of load shape changes. Thus, an assessment of program success must begin with measuring the impact of the program on load shapes. However, this measurement can be difficult because other factors unrelated to the utility's demand-side program can have a significant impact on customer loads.

Monitoring and Evaluation Approaches

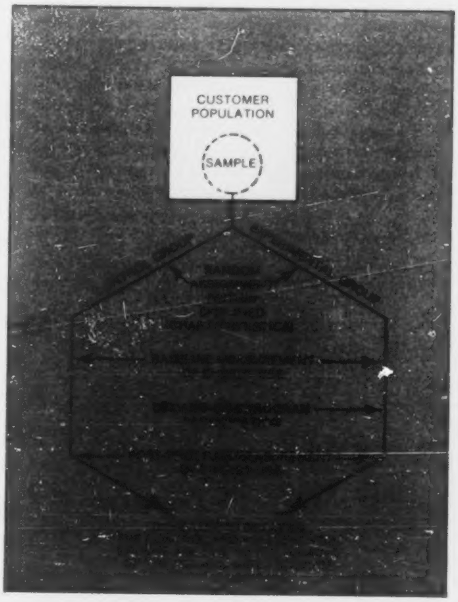
In monitoring and evaluating demand-side programs, two common approaches can be taken:

- **Descriptive**—Basic monitoring that includes documentation of program costs, activities completed, services offered, customer acceptance rates, and characteristics of program participants
- **Experimental**—Use of comparisons and control groups to determine relative program effects on participants or nonparticipants, or both.

The two monitoring approaches tend to address different sets of concerns; therefore, utilities may find it useful to incorporate both in their programs. With a descriptive approach, utility management should be aware of basic program performance indicators, in terms of both administrative procedure and target population characteristics. Information such as the cost per unit of service, the frequency of demand-side equipment installation, the type of participants (single family households or other demographic groups, and the number of customer complaints, can be useful in assessing the relative success of a demand-side management program. Recordkeeping and reporting systems can be helpful in completing descriptive evaluations.

The descriptive evaluation, however, is not adequate for systematically assessing the load shape impacts of the demand-side program. To assess load shape impacts requires the careful definition of a reference baseline against which load shapes with a demand-side management alternative can be judged. The reference baseline reflects those load shape changes that are "naturally occurring"—that is, those changes unrelated to the demand-side program itself.

In some cases, the reference baseline might be the existing forecast with appropriate adjustment to reflect the short-term conditions in the service area. In other cases, the reference might be a control group of customers not participating in the program. The energy consumption and hourly demand of program participants could also be measured before they joined the program to provide a "before" and "after" comparison.



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*Portions of the material presented in this section have been adapted from various evaluation studies completed by Synergic Resources Corporation and by Eric Hirst and colleagues at Oak Ridge National Laboratory.

If a "before" reference is used, it is often necessary to adjust data for subsequent changes in the customer's appliance or equipment stock and its usage. Adding an extra appliance (such as a window air conditioner) can more than offset any reductions in energy use resulting from a weatherization program. Similarly, the effect of direct load control of a water heater can be altered by changes in a customer's living pattern resulting, for example, from retirement or from the second spouse joining the labor force. The "before" situation must be clearly characterized so that appropriate impact of the program can be measured.

If the reference point is a group of nonparticipants, that group must have characteristics similar to those of the participants. This, of course, requires a great deal of information on both groups to allow for proper matching, including not only appliance stock data but also such information as family size, work schedules, income, and age of head of household.

Issues in Program Monitoring and Evaluation

Although there are numerous issues facing utility management as it undertakes demand-side program monitoring, most of these issues can be grouped into one of four categories: monitoring program validity, data and information requirements, management concerns, and program organization.

Monitoring Program Validity

Monitoring programs strive to achieve two types of validity: internal and external. Internal validity is the ability to accurately measure the effect of the demand-side management program on the participant group itself. External validity is the ability to generalize experimental results to the entire population. For example, controlled water heating may reduce peak load for a sample of participants, but there is no guarantee that all customers will react in a similar fashion.

Threats to monitoring program validity usually fall into two categories: problems associated with randomization and problems associated with confounding influences. Randomization refers to the degree to which the participating customer sample truly represents the total customer population involved in the demand-side program. It can also refer to the degree of bias involved in assigning customers to the experimental and control groups.

Confounding influences refer to nonprogram related changes that may increase or decrease the impact of a demand-side program. In some cases, the effect of these nonprogram related changes can be greater than the effect of the demand-side program. The list of potential sources of confounding influences is extensive, including weather, inflation, changes in personal income, and plant openings and closings.

Data and Information Requirements

Data and information requirements involve the entire process of collecting, managing, validating, and analyzing data in the monitoring and evaluation program. The cost of data collection is likely to be the most expensive part of the evaluation study. Data collection costs can be reduced with proper advance planning (having sufficient recordkeeping and reporting systems.) Sources of evaluation data include program records, customer bills, metering, and field surveys. Typically telephone surveys are used by utilities to complete field surveys. The data must be valid (measure what it is supposed to measure) and reliable (the same results would occur if repeated, within an acceptable margin of error).

The data collection system should be designed before the implementation of the demand-side program itself. There are a number of reasons for this:

- Some information is needed on a "before" and "after" program initiation basis. If the "before" data are inadequate, additional data must be collected before the start of the program.
- Some data collections take considerable time, particularly if metering of customer end uses has to be performed.
- Monitoring the effect of the demand-side alternative throughout the program allows for adjustments and modifications to the program.

In addition, information on participant characteristics, awareness of the program, motivations for participating, and satisfaction is very important in evaluating the overall success of a program.

The information-gathering mechanisms may already be in place at many utilities. Load research programs and customer surveys have long been used to collect data for forecasting and planning. The expertise gained in conducting these activities is helpful in considering the development of a monitoring program.

Management Concerns

Monitoring and evaluation programs require careful management attention. Some of the most important hurdles that must be overcome in the management of a monitoring program include:

- Assuring sufficient advanced planning to develop and implement the monitoring and evaluation program in conjunction with the demand-side activity.
- Recognizing that monitoring and evaluation programs can be data intensive and time consuming; therefore, evaluation program costs must be kept in balance with benefits.
- Establishing clear lines of responsibility and accountability for program formulation and direction.
- Organizing and reporting the results of the evaluation program to provide management with a clear understanding of these results.
- Developing a strong organizational commitment to

adequately plan, coordinate, and fund monitoring programs.

Monitoring and Evaluation Programs

Monitoring and evaluation programs can be organized in four stages: pre-evaluation planning, evaluation design, evaluation design implementation, and program feedback.

Pre-Evaluation Planning consists of working out beforehand the conceptual and logistical questions that will be encountered during the full-scale program. The "pre-program planning checklist" presented below will help guide this phase. Once the questions on the checklist have been answered, an overall assessment can be made of the needs of a monitoring and evaluation program.

Evaluation Design focuses on organizing the overall evaluation effort and developing of specific program evaluation designs. A decision whether to use descriptive or experimental or some combination of the two must be made. The major elements of an evaluation design are:

- Evaluation Objectives
- Evaluation Approach
- Data Requirements and Collection Strategy
- Data Analysis Procedures
- Final Report Format
- Program Cost
- Program Management Plan.

Design Implementation refers to initiating the evaluation framework according to the action plan, including monitoring, analysis, and recordkeeping.

Program Feedback consists of reviewing the evaluation results and determining whether any program changes are warranted.

Pre-Program Planning Checklist

Monitoring and Evaluation Program Goals

- What are the objectives of the demand-side management activity, and are they measureable?
- Are there secondary objectives to consider?
- Are there clear and measureable goals associated with implementing the demand-side activity?
- Are the cost implications of demand-side management activity sufficient to warrant evaluation cost?
- Can results from the monitoring and evaluation program be used for decision making?
- Are there clear evaluation and monitoring program goals?
- Can an evaluation be completed?

Methods

- What program results are measured?
- Can the results be generalized to a larger population?
- Can a control group or comparison [illegible] be used?
- What are the alternative evaluation designs?
- [illegible]
- What are the potential sources of bias from confounding [illegible]?
- [illegible] require a significant adaptation to [illegible]?
- [illegible]

Data Requirements and Processing

- Are there sufficient program records and other secondary data to support an evaluation?
- What are the requirements for new data collection?
- How can the data collection and analysis activity best be carried out within the existing data processing system?

Management and Other Issues

- Who should conduct the evaluation (consultants, internal staff)?
- Are there political and social issues that should be addressed?
- What is the cost of the monitoring and evaluation program?
- What degree of precision is required?
- [illegible]
- [illegible]
- [illegible]

8) HOW DO I GET STARTED IN ADDRESSING DEMAND-SIDE MANAGEMENT ISSUES AS THEY RELATE TO MY UTILITY?

The previous discussion has focused on seven major issues related to the assessment of demand-side alternatives for a specific utility. The information requirements to address these issues are, at first glance, extensive and a major hurdle in getting started in demand-side management. Typically the information can be obtained from different organizations, in different geographic locations, for different time periods, and using different collection methods. Thus, some adjustments and generalizations are often required. In any case, most utilities have a sufficient information base to initiate a preliminary analysis of demand-side alternatives.

In-house information that is of particular use includes:

- Customer appliance surveys
- Consumer behavior surveys
- Load research data on customer classes or specific end use load shapes
- In-house programs or special studies on specific end uses, such as cooling, electric space heating, or water heating
- Cost comparisons for major end uses, primarily space heating, cooling, and water heating.

Information available from sources outside the utility includes:

- Energy consumption data for residential appliances
- Load shapes for selected appliances and adjustments to make them appropriate to selected service areas
- Customer responses to time-of-use rates
- Descriptions and operating characteristics of specific demand-side alternatives
- Customer acceptance and market penetration of selected demand side alternatives
- Analysis tools for the evaluation of demand-side alternatives
- Housing characteristics and space and water heating system by dwelling type.

A list of data sources and analysis techniques is given in Volume II. Brief technical descriptions of residential demand-side alternatives, complete with pertinent technical, cost, and load impact data, as well as discussions of alternative market implementation methods, are given in Volume III. This information, combined with in-house and other readily available data, should be sufficient for many utilities to take an initial look at demand-side management alternatives.

"ELECTRICITY. IT'S THE POWER OF CHOICE"
KEY ELEMENTS OF THE EEI NATIONAL MARKETING PROGRAM

GENERAL:

- "Power of Choice" Program Catalog: Review of all projects and activities in the marketing program and details of materials available. Prices included.

RESEARCH & DEVELOPMENT:

- Three-volume series of demand/side management
  - *Volume I*—Overview of the key issues
  - *Volume II*—Evaluation of demand-side alternatives
  - *Volume III*—Technology alternatives and market implementation methods

ADVERTISING:

- Advertising kit containing:
  - Schedule of national advertising program
  - Materials for local tie-in activities
  - Program graphic style manual

PROMOTION:

- Catalog of more than 100 "Power of Choice" promotion items for local use

PUBLICITY:

- Kit of graphic and editorial materials for local use—periodically updated

OUTREACH:

- Compendium of member-company outreach programs—periodically updated

TRAINING:

- Syllabus of marketing training programs for companies desiring to activate or enhance marketing capabilities

ORGANIZATION:

- Syllabus of marketing organization alternatives for individual utility company use.

NEWSLETTER:

- A monthly report of "Power of Choice" activities, distributed free to participating companies.

For further information write:

Vice President
Customer Services & Marketing Division
Edison Electric Institute

UPCOMING EPRI RESEARCH RELATED TO DEMAND-SIDE MANAGEMENT (1983-1987)*

Energy Analysis and Environmental Division	EXPECTED AVAILABILITY				
	1983	1984	1985	1986	1987
Demand Management (Demand and Conservation Program)					
• Residential end use planning system	●				
• Industrial end use planning system		●			
• Commercial end use evaluation		●			
• Demand-side management methods				●	
• Load research transfer methods		●			
• Residential T-O-U rate response	●				
• Industrial T-O-U rate response		●			
• Consumer research techniques for electric utilities		●			
• Customer response to alternative rate structures		●			
• Cogeneration system design model	●				
Demand Forecasting (Demand and Conservation Program)					
• Load shape forecasting model—HELM	●				
• Residential energy planning system	●				
• Commercial end-use forecasting model		●			
• Short-term sales forecasting methods			●		
• Electric vehicle impacts on utility loads		●			
Decision Methods and Analysis (Economic and Environmental Integration Program)					
• Comprehensive utility planning model	●				
• Decision model for integrated demand-supply planning		●			
• Methods for prioritizing utility R&D		●			
Investment Allocation Methods (Energy Analysis Program)					
• Decision framework for allocating investments between end use and supply options	●				
• Adaptability of general business planning methods to utility decisions	●				
• Integrated investment allocations (framework)			●		
Energy Management and Utilization Division					
Heat Pumps (Residential and Commercial Program)					
• Handbook for heat pump application	●				
• Field test ground-coupled heat pump	●				
• Heat pump water heater survey	●				
• Laboratory tests of brushless DC motor heat pump		●			
• Field tests of high-efficiency central and room heat pumps		●			
• Dynamic heat pump control			●		
• Performance analysis and guidelines for multizone vs. centrally controlled heating/cooling systems			●		
• Room heat pump with improved efficiency and load characteristics and significantly reduced noise levels				●	
• Central heat pump with improved efficiency and load characteristics and multizone capability					●
[illegible]					
• [illegible]			●		
• Test package for [illegible] systems				●	
• Field test [illegible] heat storage [illegible]					●
Buildings, Lighting, and Solar (Residential and Commercial Program)					
• Indoor air quality manual	●				
• Domestic solar water heating	●				
• Domestic solar space heating	●				
• Design and retrofit practices for building ventilation		●			
Electrical Systems Division					
[illegible]			●		
Metering, Communications, and Load Control (Distribution Program)					
• AM broadcast radio for load control and distribution automation	●				

*Adapted from 1983-1987 *Research & Development Program Plan* published by the Electric Power Research Institute, January 1983. EPRI P-2799-SR

Utilities can also gain by aggressively seeking out other utilities that have a proven record in demand-side management. Establishing a network of contacts within the utility industry can provide an invaluable resource of shared experience. Those utilities interested in getting broad overviews in demand-side management or in simply keeping current with research progress can attend any number of conferences and seminars put on by leading utility groups, such as the Electric Power Research Institute (EPRI), the Edison Electric Institute (EEI), the American Public Power Association, and the National Rural Electric Cooperatives Association.

As another valuable resource, utilities can review or monitor the past, ongoing, and planned efforts of these organizations. For example, participation in EEI's "Power of Choice" marketing program can be a highly productive means of pursuing the decision to undertake a demand-side management program. The stated objective of the "Power of Choice" program is "to bring customer electricity needs and wants into better equilibrium with the industry's ability to produce." It is designed to support all categories of local marketing efforts—conservation, load management, and load growth. It is, in the words of its literature, "less a national program than it is a national federation of local programs."

Research for the program, supervised by a Marketing Task Force of senior utility executives, was initiated in 1980. In the course of the study, various "strategies" or "customer appeals" were examined and tested among consumers. The two appeals to which customers are most likely to be responsive were determined by the research to be the "Value/Cost" appeal (which postulates that by positioning electricity in terms of the everyday tasks it performs—at low cost—the public can be reminded of the incomparable service it provides and good value it represents), and the "Cost Control/Customer Option" strategy (which postulates that by positioning electricity usage/cost as controllable, the public can be assured of greater control over the monthly bill, and industry responsiveness). The basic thrust of the program is to attain its stated objective through creative exercise of these two strategies. Key elements of the program are identified in the chart on page 31.

EPRI has undertaken more than 100 individual studies related to demand-side management. Such efforts provide a broad base of support to utilities in terms of developing the technologies and the analytical tools that will enable demand-side management to become increasingly cost-effective. In recognition to the growing perception that alternative end-use options hold major promise as a tool in meeting customer needs and satisfying utility objectives, EPRI is implementing a substantially larger residential end-use R&D program. Key upcoming research activities at EPRI are presented on page 32.

Review of the EPRI and EEI schedules of upcoming activities clearly indicates the commitment of resources, both in terms of funding and staff, that these and other utility groups have made to demand-side management. A utility just beginning to investigate the possibilities of demand-side management can gain some degree of confidence in knowing that the key utility groups, along with many other individual utilities, will be actively involved in demand-side management for a long time to come. Demand-side management is being incorporated as a permanent feature and a critical element of the overall strategic planning process of utilities.

The remaining sections of this volume provide several additional sources of assistance to utilities. In the next two sections, summaries of Volumes II and III are provided. In the final section, case studies reviewing the experiences of three utilities in demand-side management are presented.

Chapter 3–OVERVIEW OF VOLUME II: THE EVALUATION OF DEMAND-SIDE MANAGEMENT ALTERNATIVES

This section presents an overview of the major elements in the evaluation of demand-side management alternatives. A more detailed discussion of the process and analysis tools is given in Volume II. The figure on page 35 shows that the evaluation process normally begins after objectives have been defined and demand-side alternatives identified. Although "Demand-Side Management Evaluation and Selection" corresponds closely to the third key issue, "Determine Evaluation Process", discussed earlier, it also encompasses both utility and customer considerations. Utility considerations are, of course, explicitly evaluated as part of the fourth key issue, "Forecast Load Shape Impacts", while customer considerations are included in the fifth key issue, "Develop Marketing Strategies". As shown in the figure, evaluation is followed by implementation and monitoring of those demand-side management programs that are undertaken.

ELEMENTS OF ANALYSIS

Both customer and utility considerations, as well as the demand-side management alternatives themselves, form what are called the "elements of analysis". These elements provide a three dimensional framework on which to base a cost benefit anlaysis. The first dimension, **customer considerations,** consists of customer acceptance/market analysis (potential market, market share) and customer response (reference load shape, customer load changes). The second dimension, **utility considerations,** includes changes in system load shape, impacts on the transmission and distribution network, and impacts on finances and operations. Finally, the third dimension, **demand-side management alternatives,** includes the applicable technologies (operating characteristics, costs), end uses, and market implementation strategies.

To do an effective evaluation or cost/benefit analysis, measures such as the effect on revenue requirement, cost per unit, and total cost must be considered with respect to each of the actors having a stake in the final analysis—namely, the utility, the customers, including both program participants and non-participants, and the regulators. In addition, demand-side management alternatives must be evaluated with respect to expected changes in the supply system.

LEVELS OF ANALYSIS

Analyses of demand-side alternatives can be performed at different levels of sophistication and detail, ranging from quick and inexpensive analyses to comprehensive and detailed analyses. To a large extent, the appropriate level of analysis depends upon the importance of the decision influenced by the analysis and upon the value of information placed by the utility. Thus, for example, funding of a 10 million dollar program in direct load control should require more than a casual analysis. In addition, the fact that many different demand-side alternatives are available to a utility requires different levels of analysis. Quick and less demanding analyses must be performed to identify those alternatives that are most attractive to the company. These alternatives must then be subjected to more extensive analysis to obtain the best estimates of their attractiveness.

Each of the three levels of evaluation that can be performed are discussed briefly below:

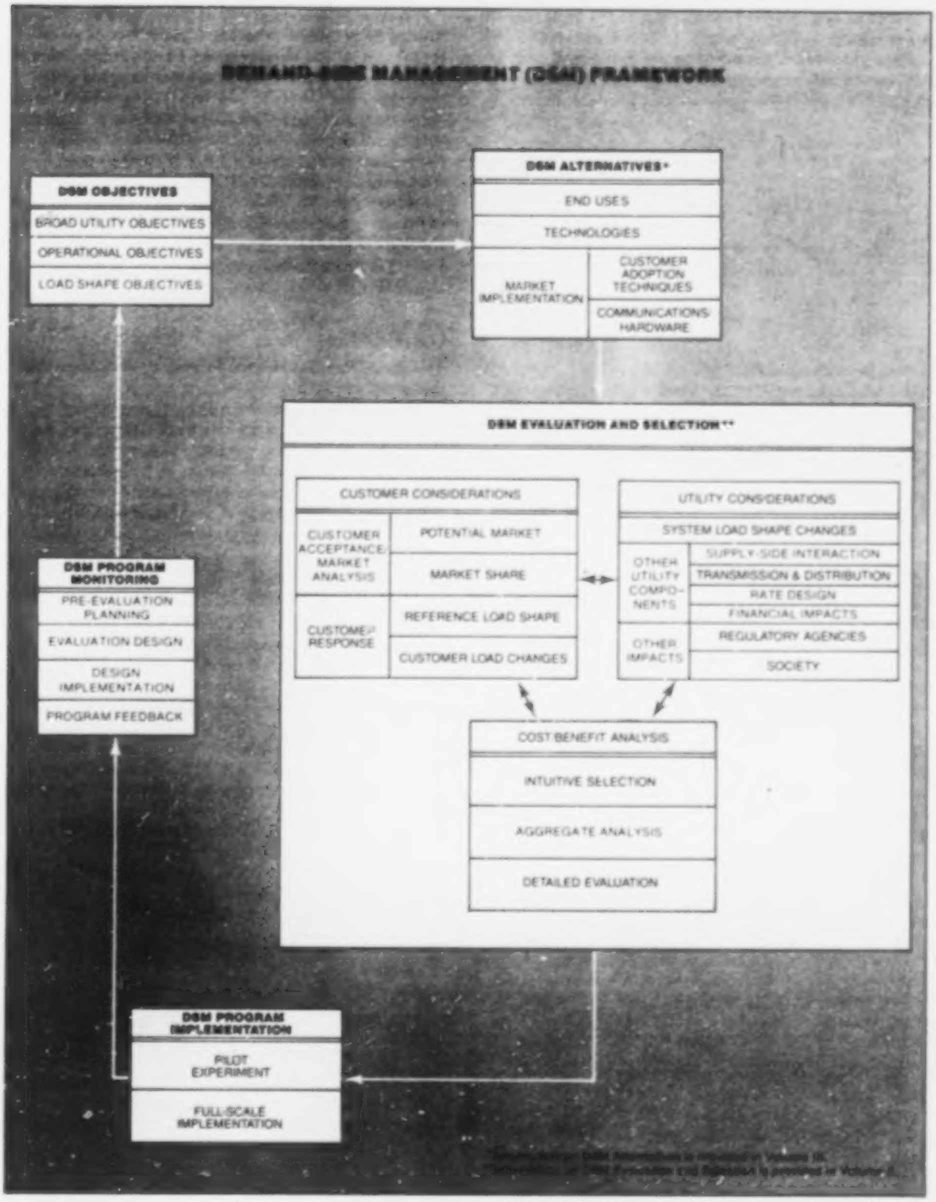
- Intuitive selection
- Aggregate analysis
- Detailed evaluation.

Intuitive Selection

Intuitive selection is a quick and inexpensive evaluation tool. The figure on page 36 shows a hierarchy of decisions in using intuitive selection as an approach to evaluation. The first box depicts a utility's operational objectives, such as decreased operating costs and reduced critical fuel usage. These objectives can be satisfied by either demand-side or supply-side strategies. Each demand-side strategy implies certain load shape objectives, such as peak clipping or strategic load growth. End uses must be selected to meet the load shape objectives. Technologies must be identified that are compatible with the selected end uses. Finally, market implementation methods compatible with the identified technologies must be developed to assure customer adoption of the demand-side management programs.

Aggregate Analysis

The second level of evaluation approaches, aggregate analysis, often involves simple computer algorithms, which actually calculate the costs and benefits of a particular demand-side management alternative. Typically, detailed production costing or load forecasting models are not included at this level of analysis. Mississippi Power and Light Company has developed a tool that plots each alternative on a graph where the horizontal axis represents extra owning cost to the customer while



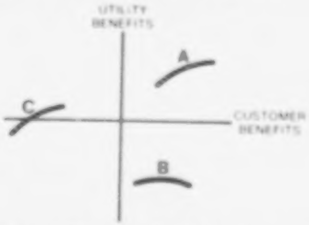
DEMAND-SIDE MANAGEMENT (DSM) FRAMEWORK

DSM OBJECTIVES
BROAD UTILITY OBJECTIVES
OPERATIONAL OBJECTIVES
LOAD SHAPE OBJECTIVES
DSM ALTERNATIVES*
END USES
TECHNOLOGIES
MARKET IMPLEMENTATION
CUSTOMER ADOPTION TECHNIQUES
COMMUNICATIONS/HARDWARE
DSM EVALUATION AND SELECTION**
CUSTOMER CONSIDERATIONS
CUSTOMER ACCEPTANCE/MARKET ANALYSIS
POTENTIAL MARKET
MARKET SHARE
CUSTOMER RESPONSE
REFERENCE LOAD SHAPE
CUSTOMER LOAD CHANGES
UTILITY CONSIDERATIONS
SYSTEM LOAD SHAPE CHANGES
OTHER UTILITY COMPONENTS
SUPPLY-SIDE INTERACTION
TRANSMISSION & DISTRIBUTION
RATE DESIGN
FINANCIAL IMPACTS
OTHER IMPACTS
REGULATORY AGENCIES
SOCIETY
COST/BENEFIT ANALYSIS
INTUITIVE SELECTION
AGGREGATE ANALYSIS
DETAILED EVALUATION
DSM PROGRAM MONITORING
PRE-EVALUATION PLANNING
EVALUATION DESIGN
DESIGN IMPLEMENTATION
PROGRAM FEEDBACK
DSM PROGRAM IMPLEMENTATION
PILOT EXPERIMENT
FULL-SCALE IMPLEMENTATION

*Information on DSM Alternatives is provided in Volume III.
**Information on DSM Evaluation and Selection is provided in Volume II.

the vertical axis represents profitability to the utility (see figure below).

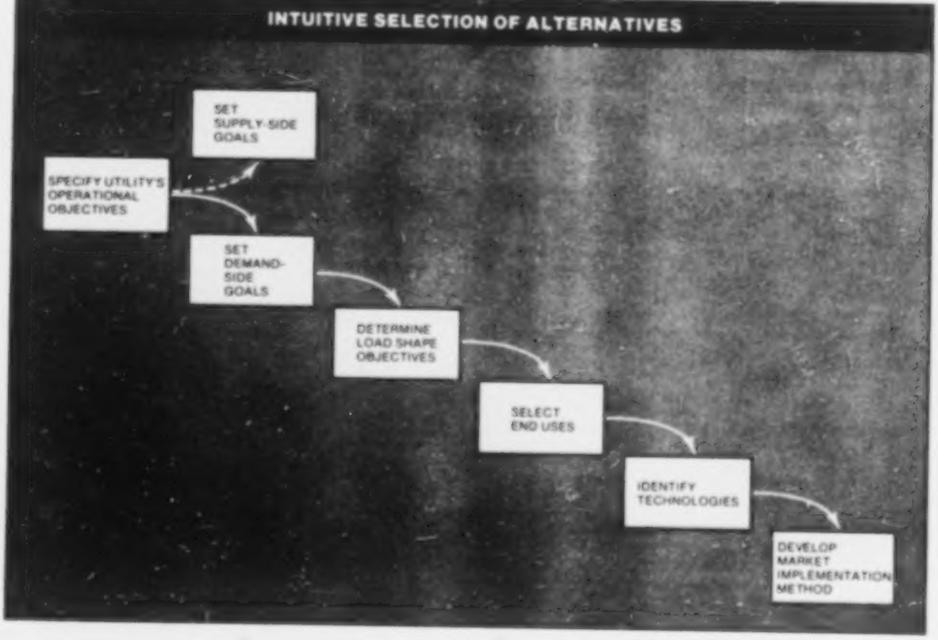
Three alternatives are plotted in the figure: A, B, and C. The alternatives are not plotted as single points but as curves in order to reflect various system sizes and competing fuels. Because Alternative A falls within the upper right-hand quadrant—i.e., the quadrant representing both positive customer benefits and positive utility benefits—it is the most attractive alternative of the three. In some cases, it may be possible to move an Alternative B into a better position by increasing rates or by charging installation or connection fees. It may also be possible to move Alternative C into a better position by offering better service or cash rebates.



A second prescreening approach has been implemented by all utilities within the State of Florida in response to a 1982 request by the Florida Public Utilities Commission. Based upon conservation program cost data, utility marginal cost data, and utility embedded cost data, the Florida model calculates a series of accounting ledgers, which show the costs and benefits of avoiding future plant expansions as a result of demand-side management. Additional cost/benefit analyses are then performed from a number of perspectives, including those of the utility, all customers, participating customers, and the State of Florida. A cost/benefit balance sheet was used to evaluate the home inspection audit from the perspective of all customers.

Detailed Evaluation

The most detailed evaluation techniques emphasize load shape and energy projections. Just as in supply-side planning, crucial inputs to the planning process are the system energy and information on the service area, such as appliance saturations, climate, and customer demographics. Using such data, changes in the load shape can be estimated for residential time-of-use pricing plans. The program to do this uses actual experimental data to derive the quantitative relationships. In addition,


INTUITIVE SELECTION OF ALTERNATIVES
SPECIFY UTILITY'S OPERATIONAL OBJECTIVES
SET SUPPLY-SIDE GOALS
SET DEMAND-SIDE GOALS
DETERMINE LOAD SHAPE OBJECTIVES
SELECT END USES
IDENTIFY TECHNOLOGIES
DEVELOP MARKET IMPLEMENTATION METHOD

results from the "Electric Utility Rate Design Study", conducted by EPRI and sponsored by organizations of the utility industry for the National Association of Regulatory Utility Commissioners, are available.

Load shape changes resulting from hardware installations, such as thermal storage devices or direct load control, can be derived from actual experiments or from engineering simulation of the underlying hardware. Engineering simulations have the advantage that once a model has been developed, a utility can quickly and inexpensively evaluate many different strategies for operating the device or different operating conditions of the device. The EPRI computer program REAP (Residential Energy Analysis Program) is one example of such engineering simulation models.

To aid utilities in forecasting load shapes and changes in the load shapes, EPRI has developed the Hourly Electric Load Model (HELM, RP 1955). This model forecasts hourly system load shapes, peak demand, and energy usage over a 10- to 30-year planning horizon. Future loads are estimated taking into account weather, as well as utility demand side activities such as pricing, conservation, and load control. The model builds up the load shape by summing numerous end uses of electricity. Energy forecasts by end use, however, are model inputs.

While the HELM model projects load shapes and load shape changes due to selected demand side management alternatives, it does not directly evaluate these alternatives. Thus, the established supply-side planning models must be used to perform the evaluation.

An integrated planning model, which combines supply, load, rates, and corporate financial simulation capabilities into a single package, is the Load Management Strategy Testing Model (LMSTM, RP 1485). LMSTM components have technical detail appropriate for analyses of demand side alternatives. The demand submodel treats loads at an end use level; the supply submodel dispatches generating capacity and direct load control devices simultaneously; the rate submodel calculates time-of-use rates by customer class; and the financial model tracks the financial impacts.

In addition to these existing tools, EPRI is currently planning to initiate a major project on demand-side management. The objective of this project is to give utilities a clear road map to planning, evaluating, and implementing demand-side management programs. A key element of the project is the development of a comprehensive decision framework, allowing both large and small utilities to select demand-side programs on a basis consistent with supply-side alternatives. The project is designed to integrate and synthesize a number of previous EPRI projects related to demand-side management, including studies on customer acceptance, customer response, new technologies, transmission and distribution impacts, implementation and monitoring strategies, and evaluation approaches.

Chapter 4–OVERVIEW OF VOLUME III: TECHNOLOGY ALTERNATIVES AND MARKET IMPLEMENTATION METHODS

This section provides an overview of the major technology and market implementation alternatives for demand-side management in the residential sector. A more detailed discussion of these alternatives in Volume III contains information to assist utility management in identifying demand-side alternatives consistent with the utility's load shape objectives. The information is presented in three distinct formats:

- **Overview Matrices**—These matrices illustrate the relationship among load shape objectives, end uses, technologies, and market implementation methods. These matrices are arranged to allow a stepwise selection process from load shape objective to end use to technology to market implementation method.
- **Functional Matrices**—For each residential demand-side technology alternative, these matrices summarize the most applicable objectives, end uses, and market implementation strategies. They also present the developmental status, utility costs and benefits, and relative customer acceptance levels associated with each technology alternative.
- **Residential Technical Briefs**—The Technical Briefs provide a concise review of cost control/customer options selected as having potential for successful incorporation into demand-side programs. The briefs include a description of the technology, along with key operating parameters, economic factors, typical applications, and the stage of development.

OVERVIEW MATRIX

The Overview Matrix depicts load shape objectives as a function of residential end use. It is intended to indicate the relative ability of each end use to meet various load

OVERVIEW MATRIX: LOAD SHAPE OBJECTIVES VS. RESIDENTIAL END USES

LOAD SHAPE OBJECTIVE	RESIDENTIAL END USES								
	Space Heating	Space Cooling	Domestic Water Heating	Lighting	Refrig-eration	Cooking	Laundry	Swimming Pools	Miscel-laneous Other
Peak Shaving	◒	◒	●					◒	◒
Valley Filling	◒		◒						◒
Load Shifting	◒		●					◒	◒
Strategic Conservation	●	●	●	◒	◒	◒	◒	◒	◒
Strategic Load Growth	●	◒				◒			◒
Flexible Load Shape	◒	◒	●						◒

● Generally Applicable ◒ Conditionally Applicable [BLANK] = Rarely or Not Applicable shape objectives. To illustrate use of the matrix, suppose the desired load shape objective is "load shifting". Reading across the chart, domestic water heating is shown to have a strong load shifting potential, while space heating, swimming pools, and miscellaneous end uses have only conditional load shifting potential. Thus, domestic water heating appears to be a load shifting option worthy of further consideration, while those end uses listed as conditionally applicable may be appropriate only in some cases (e.g., space heating can have strong load shifting potential for utilities with heavy winter loads). Those end uses with low potential will generally not provide much load shifting benefit.

FUNCTIONAL MATRIX

The second type of matrix is a more detailed, functional matrix that summarizes, for each technology option, the type and relative applicability of pertinent parameters related to successful implementation of the option. The matrix indicates the objectives and end uses best served by each technology, shows appropriate marketing alternatives and implementation considerations, and summarizes some of the data from the Technical Briefs, including developmental status, relative levels and types of costs and benefits to utilities and customers, and a relative indication of customer acceptance.

The options are grouped by generic technology category to facilitate easier use of the chart. By using the matrix, a utility planner can review common information for all the technology options and select one or more apparently suitable options for further study (using the Technology Briefs as a starting point). Using receiver switches as an example, the chart indicates that they:

- Have strong potential application to peak clipping, load shifting, and flexible load shape objectives;
- Can generally be used with space cooling, domestic water heating, and certain other end uses;
- Are typically promoted using such marketing alternatives as alternative pricing, direct incentives, direct customer contact, and other promotions;
- Require two to five years to complete program implementation and to begin realizing program results;
- Are not generally installed by customers without the presence of a utility program;
- Often involve relatively low utility and customer costs, relative high utility benefits, and moderate customer benefits;
- Typically have a moderate level of customer acceptance;
- Are commercially available, with the utility normally controlling the load shape impact of the device.

This information summary can be compared to those for similar options (perhaps timers and programmable controllers) or those for other types of options (such as Efficient Equipment and Appliances) for relative "compatibility" with utility needs. The chart can also be used in other ways—e.g., to identify all technology options with relatively low utility costs and high utility benefits, high levels of customer acceptance, and so forth. There is no "best" way to use the chart, except to keep in mind that it is mainly a summary tool to be used with other more detailed and descriptive sources in selecting appropriate options for further review.

RESIDENTIAL TECHNICAL BRIEFS

The Residential Technical Briefs provide a concise set of operating and economic information related to residential demand-side technology alternatives. As shown in the example on page 42, the briefs follow a standard format consisting of several sections. A short summary section at the top of the front page of the brief lists the end uses, research status, and load shape objectives for which the option is best suited. Using the "Add-on Heat Pump" Technical Brief as an example, the most appropriate end use to target is space heating and cooling; the technology is commercially available and research and development to improve the technology is planned by EPRI; and the most appropriate load shape objectives to consider are strategic load growth and strategic conservation.

The next several sections of the brief present descriptive information, specifications, and a discussion of applicability and implementation considerations. A short explanation of the purpose and operating principle of the option is provided, as is a drawing showing a typical system configuration and major option components. Following this is a brief discussion of the applicability of the option to cost control/customer option programs, focusing on customer or end use characteristics required for successful use of the option and indicating any potential pitfalls that might be encountered. An implementation section lists special considerations for utilities considering a program involving the option.

An evaluation section discusses the option in terms of availability, costs, reliability, utility and customer benefits, customer acceptance, and utility programs under way. Current ranges of installed costs to the customer and utility are presented next, along with an indication of typical maintenance costs. Under the reliability heading, any available information on anticipated equipment life and reported failure rates is presented.

Utility benefits are discussed in terms of typical effects on load shape, peak load, energy sales, etc., with any appropriate qualifications regarding dependence of the benefits on operating characteristics such as peak season, relative level of reserve margin, and the like. Quantitative data are shown where available, with notation as to types of data sources and measurement programs. Customer benefits are presented in terms of typical energy savings ranges, types and amounts of incentives normally offered, and any other benefit normally derived from using the

INTUITIVE SELECTION APPROACH: FUNCTIONAL MATRIX

KEY

RELATIONSHIPS BETWEEN TECHNOLOGIES, OBJECTIVES, END USES, AND MARKETING ALTERNATIVES

○ = GENERALLY APPLICABLE
◐ = CONDITIONALLY APPLICABLE
[BLANK] = RARELY OR NOT APPLICABLE

OTHER IMPLEMENTATION ASPECTS

RELATIVE PROGRAM IMPLEMENTATION TIME (PLANNING AND INSTALLATION)
● = <2 YEARS
◐ = 2-5 YEARS
[BLANK] = >5 YEARS

RELATIVE TIME TO REALIZE PROGRAM RESULTS
● = <2 YEARS
◐ = 2-5 YEARS
[BLANK] = >5 YEARS

SENSITIVITY TO NON-UTILITY- INDUCED IMPLEMENTATION
● = HIGH
◐ = MEDIUM
[BLANK] = LOW

UTILITY CRITERIA

RELATIVE PEAK LOAD IMPACT (COINCIDENT)
A = <0.5 KW POTENTIAL DECREASE
B = 0.5-1.5 KW POTENTIAL DECREASE
C = >1.5 KW POTENTIAL DECREASE
D = <0.5 KW POTENTIAL INCREASE
E = 0.5-1.5 KW POTENTIAL INCREASE
F = >1.5 KW POTENTIAL INCREASE
G = POTENTIAL INCREASE OR DECREASE

RELATIVE ENERGY CONSUMPTION IMPACT
H = <1000 KWH POTENTIAL INCREASE
I = 1000 KWH POTENTIAL INCREASE
J = >5000 KWH POTENTIAL INCREASE
K = <1000 KWH POTENTIAL DECREASE
L = 1000-5000 KWH POTENTIAL DECREASE
M = >5000 KWH POTENTIAL DECREASE
N = POTENTIAL INCREASE OR DECREASE

RELATIVE COSTS
O = <$100/CUSTOMER
P = $100-$500/CUSTOMER
Q = >$500/CUSTOMER
R = >>$500/CUSTOMER

CUSTOMER CRITERIA

RELATIVE BENEFITS
A = <2 YEAR PAYBACK
B = 2-5 YEAR PAYBACK
C = >5 YEAR PAYBACK
D = PROBABLY >>5 YEAR PAYBACK
E = (OTHER INCENTIVE CRITERIA INVOLVED)

RELATIVE COSTS	CUSTOMER ACCEPTANCE
F = <$100	J = EXCELLENT
G = $100-$500	K = GOOD
H = $500-$1000	L = FAIR
I = >$1000	M = POOR

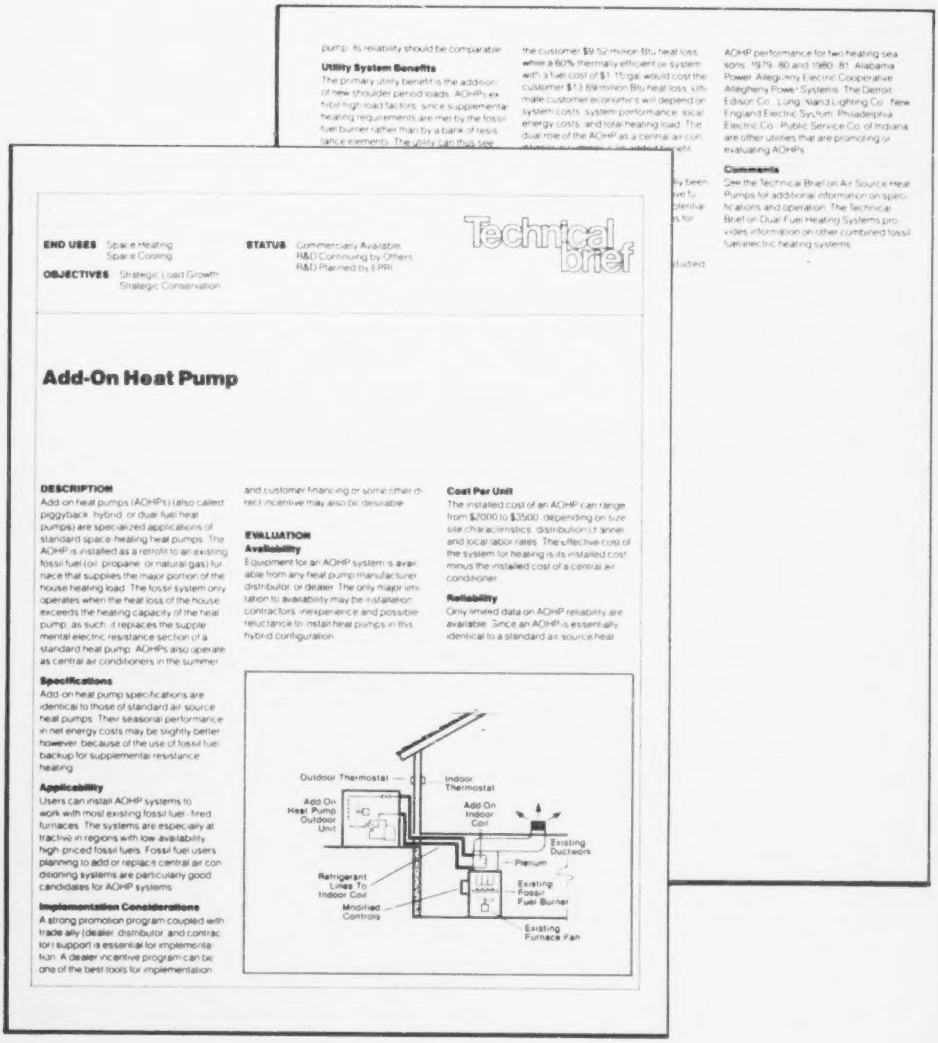
DEVELOPMENTAL STATUS

☐ = COMMERCIALLY AVAILABLE
[BLANK] = LIMITED OR NO COMMERCIAL AVAILABILITY
1 = R&D BY OTHERS
2 = R&D BY EPRI
3 = R&D BY BOTH

POST-IMPLEMENTATION CONTROL OF LAND SHAPE IMPACTS

CUST = CUSTOMER
UTIL = UTILITY
BOTH = BOTH
NEITH = NEITHER

INSULATION (CEILING, WALL, FLOOR)				●			●	●						◐	●	●	◐	◐	◐	◐	◐	●	A	A	L	M	O	B	I	J	☐	NEITH
STORM/THERMOPANE WINDOWS AND DOORS				●			●	●						◐	●	●	●	◐	◐	◐	◐	●	A	A	K	K	O	C	I	J	☐	NEITH
WINDOW TREATMENTS				●			●	●		◐				◐	●	●	●	◐	◐	●	◐	●	A	A	K	K	O	C	G	L	☐	CUST
DUCT AND PIPE INSULATION				●			●	●	●					◐	●	●	●	◐	◐	●	◐	●	A	A	K	K	O	C	F	K	☐	NEITH
WATER HEATER BLANKET				●					●					◐	◐	●	●	◐	◐	●	◐	●	A	A	K	K	O	A	F	K	☐	NEITH
INFILTRATION AND INDOOR AIR QUALITY CONTROL				●			●	●					◐	◐	◐	●	●	◐	◐	●	◐	●	A	A	L	M	O	B	H	K	☐ 3	NEITH
PASSIVE SOLAR DESIGN		◐		●			●	●		◐				◐	◐	◐	◐	◐	◐	◐		●	G	G	N	M	O	P	I	L	☐ 1	NEITH
DAYLIGHTING				●						●						◐	◐	◐	◐	◐		●	A	A	K	K	O	E	H	K	☐	NEITH
CENTRAL AIR SOURCE HEAT PUMP				●	◐		●	◐						◐	◐	●	●	●	●	●	●	●	G	B	N	M	O	B	I	K	☐ 3	CUST
GROUND WATER SOURCE HEAT PUMP				●	◐		●	◐						◐	◐	◐	●	●	◐	◐	◐	◐	G	B	N	M	O	B	I	L	☐ 3	CUST
GROUND-COUPLED HEAT PUMP				●	◐		●	◐						◐	◐	◐	●	●	◐	◐		◐	G	B	N	M	O	B	I	M	☐ 1	CUST
MULTIZONE HEAT PUMP	◐			●	◐		●	◐						◐	◐	◐	◐	●	◐	●	◐	◐	G	C	N	M	O	B	I	L	☐ 3	CUST
ROOM HEAT PUMP				●	◐		●	◐						◐	◐	◐	◐	●	◐	●	◐	◐	G	C	N	M	O	B	I	K	☐ 3	CUST
DUAL FUEL HEATING SYSTEMS	●	◐			●		●							●	◐	●	●	●	◐	◐	◐		-	C	-	N	P	B	I	K	☐ 1	UTIL
ADD-ON HEAT PUMP	◐	◐			●		●	◐						◐	◐	●	●	●	●	●	●	◐	G	G	N	N	O	B	I	K	☐ 3	CUST
ACTIVE SOLAR SPACE HEATING	◐		◐	●			●							◐	◐	●	●	●	◐	◐		●	-	G	-	M	O	D	I	L	☐ 3	CUST
TASK HEATING				◐	●		●									◐	◐		◐	●	◐	●	-	G	-	I	O	E	G	J	☐ 1	CUST
ZONED RESISTANCE HEATING					●		●							●		◐	◐	◐		◐			-	G	-	M	O	B	H	K	☐ 3	CUST
HEAT PUMP WATER HEATER				●					●					◐	◐	●	●	●	●	●	◐	◐	A	A	L	L	P	C	I	K	☐ 1	CUST
HEAT RECOVERY WATER HEATER				●					●						◐	●	●	●	●	●	◐	◐	A	A	K	K	P	C	H	K	☐ 1	CUST
SOLAR WATER HEATING				●	◐				●			◐		◐	◐	●	◐	●	◐	●	◐	●	G	G	L	L	P	C	I	K	☐	CUST
HIGH-EER AIR CONDITIONER				●				●							◐	●	◐	●	●	●	●	●	A	-	L	-	O	B	G	K	☐	CUST
ENERGY-EFFICIENT COOKING APPLIANCES				●	◐						●					●	◐	●	●	●	◐	●	A	A	K	K	O	C	H	K	☐	CUST
ENERGY-EFFICIENT CLOTHES WASHERS AND DISHWASHERS				●							●			◐		●	◐	●	●	●	◐	●	A	A	K	K	O	B	G	J	☐	CUST
ENERGY-EFFICIENT REFRIGERATORS AND FREEZERS				●							●				◐	●	◐	●	●	●	◐	●	A	A	K	K	O	B	F	G	☐	CUST
EFFICIENT LIGHTING FIXTURES AND LAMPS				●						●						●	◐	●	◐	●	●	●	A	A	K	K	O	B	F	K	☐ 1	CUST
CENTRAL CERAMIC HEAT STORAGE		●	●				●							●	◐	●	◐	●	◐	◐	◐		-	C	-	J	Q	C	I	K	☐ 1	CUST
ROOM CERAMIC HEAT STORAGE		●	●				●							●	◐	●	◐	●	◐	◐	◐		-	C	-	J	Q	C	I	K	☐ 3	CUST
SLAB HEATING		◐	●				●							●	◐	●	◐	●	◐	◐	◐		-	C	-	J	Q	C	I	L	☐	CUST
RESIDENTIAL ICE STORAGE AIR CONDITIONING		●	●					●						◐		◐							C	-	H	-	R	D	I	M		CUST
RECEIVER SWITCHES	●		●			●	◐	●	●			◐	◐	◐	●	◐	◐			◐	◐		B	B	-	-	O	E	-	K	☐	UTIL
WATER HEATER CYCLING CONTROL	●		●			●			●					◐	●	●	●		●	◐	◐		A	B	-	-	O	E	-	K	☐ 1	UTIL
AIR CONDITIONER CYCLING CONTROL	●					●		●						◐	●	●	●		●	◐	◐		B	-	K	-	O	E	-	L	☐ 1	UTIL
VARIABLE-SERVICE-LEVEL DEVICES	◐					●		◐	◐		◐		●	●	◐	●	●		●	◐	◐		A	A	-	-	O	E	F	L	☐	BOTH
TIMERS	●		●	◐					●	●		◐		●	●	●	●		◐	●	●	◐	B	B	-	-	P	B	G	K		BOTH
APPLIANCE INTERLOCKS	●		●					●	●		◐	◐		●	◐	●	●	◐	◐	◐			B	B	-	-	P	B	G	K	☐	CUST
PROGRAMMABLE CONTROLLERS	●						◐	●	●		◐			●	◐	●	●	◐	◐	◐			B	B	-	-	P	B	H	K	☐ 1	CUST
TEMPERATURE-ACTIVATED SWITCHES	●							●						◐	●	●	●		◐	◐	◐		B	-	K	-	P	B	F	L		UTIL
LOAD MANAGEMENT THERMOSTATS	●		●				●	●						◐	●	●	●		◐	◐	◐		B	B	K	K	P	E	G	L		BOTH
SWIMMING POOL PUMP CONTROL	◐		●	◐								●		●	●	●	●	◐	◐	●	●		B	-	K	-	O	A	F	J	☐	NEITH



END USES Space Heating
Space Cooling

OBJECTIVES Strategic Load Growth
Strategic Conservation

STATUS Commercially Available
R&D Continuing by Others
R&D Planned by EPRI

Technical brief

Add-On Heat Pump

DESCRIPTION

Add-on heat pumps (AOHPs) (also called piggyback, hybrid, or dual fuel heat pumps) are specialized applications of standard space-heating heat pumps. The AOHP is installed as a retrofit to an existing fossil fuel (oil, propane, or natural gas) furnace that supplies the major portion of the house heating load. The fossil system only operates when the heat loss of the house exceeds the heating capacity of the heat pump; as such, it replaces the supplemental electric resistance section of a standard heat pump. AOHPs also operate as central air conditioners in the summer.

Specifications

Add-on heat pump specifications are identical to those of standard air source heat pumps. Their seasonal performance in net energy costs may be slightly better, however, because of the use of fossil fuel backup for supplemental resistance heating.

Applicability

Users can install AOHP systems to work with most existing fossil fuel-fired furnaces. The systems are especially attractive in regions with low availability, high-priced fossil fuels. Fossil fuel users planning to add or replace central air conditioning systems are particularly good candidates for AOHP systems.

Implementation Considerations

A strong promotion program coupled with trade ally (dealer, distributor, and contractor) support is essential for implementation. A dealer incentive program can be one of the best tools for implementation and customer financing or some other direct incentive may also be desirable.

EVALUATION

Availability

Equipment for an AOHP system is available from any heat pump manufacturer, distributor, or dealer. The only major limitation to availability may be installation contractors' inexperience and possible reluctance to install heat pumps in this hybrid configuration.

Cost Per Unit

The installed cost of an AOHP can range from $2000 to $3500, depending on size, site characteristics, distribution channel and local labor rates. The effective cost of the system for heating is its installed cost minus the installed cost of a central air conditioner.

Reliability

Only limited data on AOHP reliability are available. Since an AOHP is essentially identical to a standard air source heat pump, its reliability should be comparable.

Utility System Benefits

The primary utility benefit is the addition of new shoulder period loads. AOHPs exhibit high load factors, since supplemental heating requirements are met by the fossil fuel burner rather than by a bank of resistance elements. The utility can thus see

the customer $9.52/million Btu heat loss, while a 60% thermally efficient oil system with a fuel cost of $1.15/gal would cost the customer $13.69/million Btu heat loss. Ultimate customer economics will depend on system costs, system performance, local energy costs, and total heating load. The dual role of the AOHP as a central air con

lly been
ve fu
otential
s for

studied

AOHP performance for two heating seasons, 1979–80 and 1980–81. Alabama Power, Allegheny Electric Cooperative, Allegheny Power Systems, The Detroit Edison Co., Long Island Lighting Co., New England Electric System, Philadelphia Electric Co., Public Service Co. of Indiana are other utilities that are promoting or evaluating AOHPs.

Comments

See the Technical Brief on Air Source Heat Pumps for additional information on specifications and operation. The Technical Brief on Dual Fuel Heating Systems provides information on other combined fossil fuel/electric heating systems.

option. A qualitative indication of customer acceptance of the option is provided, and specific information on any common problem areas identified in utility programs to date is presented where available. Finally, examples are shown of types of utility programs under way, numbers of programs where known, parameters common to successful utility programs, and suggested sources of additional information.

Chapter 5–CASE STUDIES OF UTILITY DEMAND-SIDE PROGRAMS

Demand-side management now plays a significant role in many utilities. An indication of utility activity in many areas of demand-side management is contained in annual surveys sponsored by EPRI. The conclusions from the 1982 survey dealing with demand-side management* are clear:

- Many activities are under way across the nation—probably close to 1,000 separate projects.
- The number of activities is growing—an increase of approximately 40 percent during the 1980-81 period alone.
- The range of projects is extremely diverse. Each of the four major groups of residential technology options (building envelope options, efficient equipment and appliances, thermal storage equipment, energy and demand control equipment) is represented by a substantial number of utility projects.
- More than 200 different utilities are involved in demand-side management projects. This number includes both large and small, public and private, and winter and summer peaking utilities.

The wealth of practical experience and insights gained by the individual utilities conducting these projects represents a tremendous resource to utilities considering a new or expanded demand-side management program. Most utilities are quite willing to discuss informally the significant factors that made their own program a success or a failure. Active participation in conferences and workshops and proactive visits to individual utilities can go a long way in building a time- and money-saving network of demand-side management experience.

Consistent with this goal of sharing demand-side management, this section presents brief case studies of three utility programs:

- Portland General Electric (PGE)—"Adjusting Strategies to Meet a Changing Environment"
- Southern Company—"Implementing Total Energy Resource Planning"
- Philadelphia Electric (PECO)—"Increasing Load Factor by Promoting Heat Pumps".

These case studies give the reader an understanding of the importance these utilities place on their demand-side management programs.

The three selected utilities represent a broad range of programs and geographical regions. The Philadelphia Electric Company and Portland General Electric cases demonstrate contrasting approaches to marketing demand-side alternatives. Philadelphia Electric has a unique relationship with builders and heat pump retailers in the Philadelphia area. Therefore, marketing efforts, such as training sessions and financial incentives, are aimed at trade organizations rather than directly at the customers. PGE, on the other hand, marketed its past weatherization and energy audit programs directly to the residential consumer.

The "Total Energy Resource Planning" (TERPS) approach currently being pursued at the Southern Company is in its early stages of development, and some issues remain unaddressed. Therefore, the case study concentrates only on Southern's approach to developing benefits, determining a selection process, and forecasting load shape impacts.

These case studies show that, although demand-side management can take many forms, it has developed into an integral component within the planning process at many utilities. Despite diversity in objectives, approaches, and marketing strategies, common themes emerge from each of the case studies. These themes can be transferred to other utilities considering demand-side alternatives. It is these themes that this section identifies and highlights through specific examples.

Although these case studies represent only a small number of the demand-side management alternatives in effect within the utility industry, they do provide a perspective on the importance that more and more utilities are placing on their demand-side programs. In reviewing the case studies, the reader may draw a number of conclusions, including:

- Demand-side management programs play an active role in the planning activities of many utilities.
- These programs offer a great deal of diversity with respect to objectives, alternatives considered, levels of analysis, and market implementation strategies.
- All successful demand-side management programs are sensitive to the eight major issues.
- The use of demand-side management can lead to significant savings for the utility, its customers, and society.

Each case study is organized into two sections. The first section provides a description of the overall program and its motivation. The second section centers on the eight issues in demand-side management that were

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*Energy Utilization Systems, Inc., *1981 Survey of Utility Load Management, Conservation, and Solar End-Use Projects*, November 1982, Published by Electric Power Research Institute, Report No. EM-2649 (RP 1940-1).

identified and discussed in Chapter 2. The case study describes briefly how each utility might have responded to these eight issues.

Expertise in demand side management is still rapidly evolving. As such, few, if any, utilities could respond right now to every single issue to its own satisfaction. In addition, each utility places differing degrees of emphasis on responding to these issues. In fact, these case studies show that it is not even necessary to respond to the issues in the same order for each analysis.

PORTLAND GENERAL ELECTRIC COMPANY

"ADJUSTING STRATEGIES TO MEET A CHANGING ENVIRONMENT"

> "PGE's new program looks at marketing and energy conservation as complementary terms. The true message focuses on the use of energy from an economic or cost/benefit standpoint. We'll research customer energy needs, wants, and desires and will market wise and efficient products and services that make sense for a segment or all consumers."
>
> — *Chuck Heinrich, Sr. Vice President of Electric Operations*

INTRODUCTION AND BACKGROUND

In the mid 1970's PGE was facing near term resource deficits. The high marginal costs of new thermal resources compared to low average costs of the hydro system made the economics of demand-side management attractive to PGE. Conservation resources could be brought on line faster than new thermal plants, conservation was and is politically more acceptable and the economics from the customer and ratepayer perspective were favorable. Recently, the success of a variety of conservation programs, detailed below, coupled with PGE's involvement in a regional power planning and conservation process, have dramatically reduced load growth to less than 2 percent per year. Given reduced load forecasts in 1983, objectives and strategies were reviewed, resulting in the formation of the marketing department whose emphasis includes meeting the needs and wants of our customers. Those needs may be for weatherization services to reduce electric consumption or for a heat pump evaluation to reduce total heating costs. The purpose of including this case study, therefore, is twofold: (1) to describe PGE's earlier demand-side program and (2) to illustrate the dynamics of demand-side management. This last point is of utmost importance. It demonstrates the need to constantly assess the direction and emphasis of a demand-side program and the need to alter course as economic or operating conditions change.

In addition to weatherizing residences, Portland General Electric has wrapped over 103,000 water heaters as a free service to its residential customers. The company estimates that since its inception in the summer of 1978, the program has saved over 55,000 Mwh annually.

In another effort to save electricity, two shower restrictors were mailed with the regular monthly billing to all residential customers of PGE. A follow-up survey showed that 115,287, or 28 percent, of the restrictors had been installed for an annual savings of 66,000 Mwh.

Under a program initiated in October 1980, a customer can receive a $300 cash rebate from PGE for installing either a solar domestic water heater or a water heater heat pump. Instead of the rebate, the company will also advance a customer the money that would be received from state and federal energy tax credits as an interest-free loan. According to PGE, the program has saved the company 7,700 Mwh annually through the 2,562 solar units and 301 water heater heat pumps installed.

PORTLAND GENERAL ELECTRIC COMPANY
1982 STATISTICS

TOTAL SALES 14.9 Million Mwh
LOAD FACTOR 63.9%
TOTAL CAPACITY 3,057 Mw
SUMMER PEAK 1,909 Mw
WINTER PEAK 2,450 Mw

FIVE-YEAR PEAK LOAD GROWTH (1978-82) 0.6%

GENERATION MIX		SALES MIX	
HYDRO	29.0%	RESIDENTIAL	38%
PUBLIC UTILITY DISTRICT SHARE	24.5%	COMMERCIAL	26%
NUCLEAR	17.0%	INDUSTRIAL	22%
COAL	11.3%	OTHER	14%
STORAGE	9.4%		
OTHER PURCHASES	8.8%		

Various brochures developed in conjunction with the series are available to customers upon request.

PGE's approach to addressing the eight major issues in selecting and implementing demand-side management alternatives is described below.

PGE's APPROACH TO DEMAND-SIDE MANAGEMENT ISSUES

1) ESTABLISH PROGRAM OBJECTIVES

Before embarking on a large scale demand-side management program, PGE identified a number of potential benefits that were later translated into program objectives. These included:

- Company and customer flexibility would increase as a result of demand-side management, with the Company having potentially attractive new business opportunities and the customer having an alternative to higher electric bills.
- Benefits from demand-side management programs could be realized in higher system reliability and lower oil exposure, improved financial indicators, or a balanced combination of both.
- Customer and regulatory reaction were expected to be favorable, and favorable reaction has been demonstrated in PGE's weatherization program and recent PGE customer opinion surveys.

2) IDENTIFY ALTERNATIVES

PGE identified voluntary and mandatory alternatives involving energy management and service degradation.

The following table lists the alternatives considered:

	Voluntary	Mandatory
Energy Management	PGE Weatherization Program Economic incentives for solar. Economic incentives for cogeneration.	Insulation standards for new buildings. Weatherization required before sale of home. Higher efficiency appliances.
Service Degradation	Optional interruptible or off-peak rates. Moderate constant energy.	Mandatory interruptible or off-peak rates for large-use customers. Ban on specific uses of electric energy.

3) DETERMINE EVALUATION PROCESS

PGE's load and load growth characteristics were analyzed in some detail to identify those areas of existing and future energy requirements most suitable for management. This required a detailed end use analysis. Programs were then identified to address those areas, outlining costs and benefits as they would apply to PGE, ratepayer, and stockholder interests. Finally, a specific action plan was proposed.

4) FORECAST LOAD SHAPE IMPACTS

Through the use of market surveys, production costing models, and load forecasting models, PGE management concluded that voluntary cost-effective energy management would significantly reduce load growth. The base 20-year forecast of load growth could be reduced from 3.7 percent to 3.0 percent. Three-quarters of the load reduction occurs in the first 10 years (1980-1989). It was estimated that load would be reduced by an average of 317 MW, or roughly 3 percent, by 1989. By 1999, load would be reduced by 420 MW. The figure on page 47 shows the expected savings in each of the proposed demand-side management programs.

5) DEVELOP MARKETING STRATEGIES

Market implementation strategies at PGE are constantly being updated in response to changes in load and customer reactions. Initially, PGE's weatherization program was promoted through brochures, mailings, media advertising, and a local TV show. Following a survey of customers in 1981, new marketing implementation strategies were developed, including:

- Revise the current weatherization programs to focus on promoting weatherization in those residential groups that have been less likely to weatherize in the past.
  - The renter/landlord
  - The older retired resident
  - The younger, two-income household.
- Promote audits to new customers at the time they open an account or in a follow-up contact and promote the audit as a benefit PGE offers a new customer. A new resident may have a better predisposition to weatherization than the former resident, and hence may undertake weatherization actions that the previous resident would not.
- Promote a range of financial programs from Zero Interest Loan Program (ZIP) to rebates. Offering a variety of programs reaches a wider range of customers. The rebate option could include a flat rate per kilowatt-hour payment, wherein a do-it-yourselfer might actually make money (the utility payment would exceed his costs).

6) IMPLEMENT PROGRAMS

Action plans like the one that follows are generated every year to implement the proposed plans.

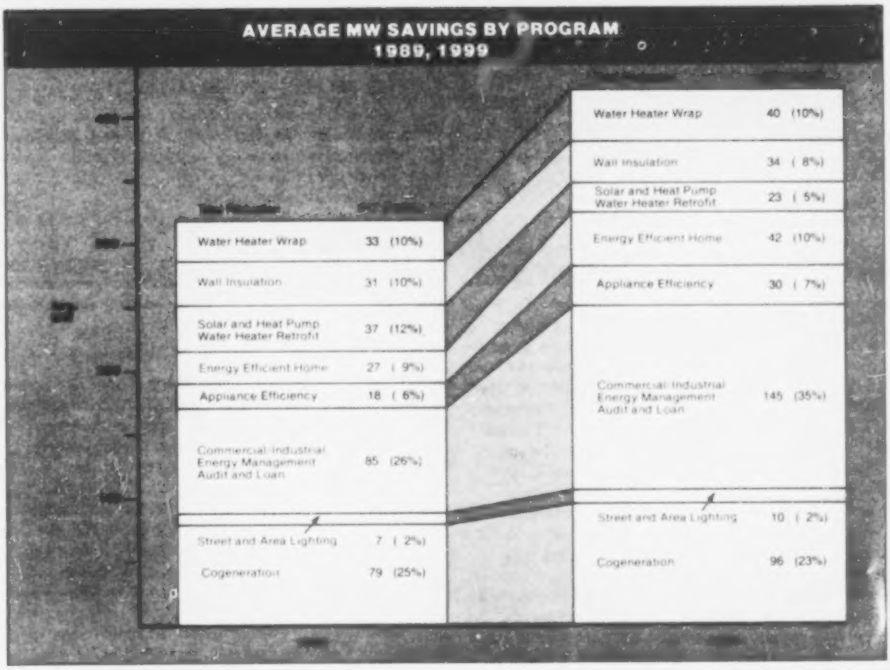
ACTION PLAN

Program	Action	Date
Residential water heater wrap	Launch pilot summer program — Hire students (13) — Hire supervisors (4) — Ensure sufficient materials — Line up trucks	Summer
	Include 1981 cost in rate filing	Spring
Retrofit wall insulation	Reach corporate consensus	Spring
	Include 1981 cost in rate filing	Spring
	File with PUC	Summer
Retrofit solar and heat pump water heaters	Conduct market research	Currently under way
	Include 1981 cost in rate filing	Spring
	Begin staffing	Fall/Winter
Residential connect charges and energy-efficient homes	Participate in connect charge hearings	Spring/Summer
	Include 1981 costs in rate filing	Spring
	Establish efficient home criteria	Summer
Commercial/industrial energy management	Conduct market research	Spring
	Include 1981 costs in rate filing	Spring
	File program with PUC	Summer
	Begin staffing	Winter
Street and area lighting	Inform customer of plan	Spring
	File for change in rate design and depreciation policy	Spring
Cogeneration	Analyze cogenerating requirements	Spring
	Participate in cogeneration [illegible]	Spring

7) MONITOR RESULTS

In 1981, 758 single family PGE customers were selected to participate in a survey to assess the level of participation and energy savings resulting from PGE's demand-side planning programs. The survey showed that:

- More than 53 percent of all single-family electrically heated homes existing in PGE's service area prior to July 1978 have under-gone significant weatherization during the last 3 years, more than half of these through PGE's audit and/or financing program.
- Substantially more weatherization measures per home have been taken in homes weatherized with PGE financing than in homes weatherized without PGE financing.
- If the program offered a partial up-front cash rebate, as opposed to zero-interest financing, approximately the



AVERAGE MW SAVINGS BY PROGRAM
1989, 1999

same amount of weatherization would have occurred.

- Homes weatherized through ZIP over the last 3 years have, on the average, experienced a 16-percent reduction in annual consumption (or 3,800 kilowatt hours). Homes receiving a PGE audit, but weatherized with other than ZIP financing, have experienced a reduction in average annual consumption of only 9 percent (or 2,017 kilowatt hours).
- Of the total reduction in usage occurring in single-family, electrically heated homes that have been weatherized during the last 3 years, about three quarters results from weatherization and about one quarter from switching to wood for space heating. In homes weatherized under ZIP financing, only one sixth of the reduction in consumption arises from burning wood.
- Typically, those choosing to weatherize consume higher-than-average amounts of electricity, are younger and more educated than average, have a moderately high income, and have a larger-than-average family.
- Typifying those who are much less likely to weatherize are the renter who cannot or is less inclined to participate in various weatherization programs, the older/retired person, and younger families with typically a two-person income and no one home during the day.

8) INITIATE ACTION: ADJUSTING OBJECTIVES AND STRATEGIES

By year end 1983, the 20-year forecast of electric load growth had been reduced to about 1.5 percent. This low load growth rate dictated some adjustment to PGE's load management objectives. Consequently, some conservation programs and consumer incentives have been reduced. Conservation is now perceived as a resource that will be acquired as it is needed—a new emphasis in marketing is underway with a major add-on heat pump promotional program beginning. Other elements of the marketing program will be implemented in 1984.

Managing energy growths through load management has changed to managing the wise and efficient use of energy resources. Given a forecasted 10-year surplus of resources over loads, various new strategies are being examined with the objective of bringing our load/resource picture into a balanced position. A new emphasis in marketing is underway beginning with a major add-on heat pump program working with contractors, dealers, and customers.

THE SOUTHERN COMPANY

"IMPLEMENTING TOTAL ENERGY RESOURCE PLANNING"

> "Because they represent major corporate investments, demand side programs must be evaluated by their contribution to our overall corporate objectives. We think TERPS brings together the various disciplines needed to adequately examine these marketing alternatives."
>
> — *Edward L. Addison, President of The Southern Company*

INTRODUCTION AND BACKGROUND

Southern Company has recently embarked on an innovative planning methodology called "Total Energy Resource Planning System" (TERPS) to provide general direction for beneficial modification of the system's future load characteristics. In the first place, three generic types of load shape changes are being considered: 1) summer peak shave/valley fill, 2) winter load build, and 3) annual load build. Each change is being evaluated independently.

The Southern Company approach is unique in identifying objectives and a selection process without explicitly evaluating options for meeting the objectives. In other words, an objective such as "lower system costs by implementing peak shave/valley fill" is identified, reasonable load shape changes are developed, and these are evaluated through the use of production costing and financial models. The results of these evaluations are estimates of operating advantages and cost savings. In this way, the Company knows how much it is willing to spend to achieve certain load shape changes. Although the Southern approach will eventually address all eight of the demand-side planning issues, progress to date has emphasized Questions #1 (describe benefits), #3 (determine selection process), and #4 (forecast load shape impacts). As a result, only their approach to these three questions is described.

THE SOUTHERN COMPANY 1982 STATISTICS

TOTAL SALES: 96.8 Million Mwh

LOAD FACTOR: 59.8%

TOTAL CAPACITY: 24,637 Mw

SUMMER PEAK: 17,840 Mw
WINTER PEAK: 16,448 Mw

FIVE-YEAR PEAK LOAD GROWTH (1977-82): 1%

GENERATION MIX		SALES MIX	
COAL	79%	RESIDENTIAL	25%
NUCLEAR	14%	COMMERCIAL	19%
HYDRO	7%	INDUSTRIAL	34%
		OTHER	22%

SOUTHERN'S APPROACH TO DEMAND-SIDE MANAGEMENT ISSUES

1) ESTABLISH PROGRAM OBJECTIVES

The three load shape modification alternatives being considered are designed specifically to meet the following company-wide objectives:

- Lower system costs
- Enhance competitiveness
- Improve financial integrity
- Improve company credibility
- Raise effectiveness of consumers' total energy budget
- Lower undersirable impacts across customer classes.

Measures of effectiveness developed with respect to these objectives appear in the adjacent table.

3) DETERMINE EVALUATION PROCESS

Each of the three generic load shape change alternatives is evaluated based on its ability to satisfy these objectives. The impacts of each load change type are compared to a base case system forecast. The comparison assesses the relative costs and benefits accruing to customers and to stockholders. Although there are a number of ways to combine several effectiveness measures into a single preference index, they all ultimately depend upon particular decision makers' judgements. The working group at Southern has not attempted to develop such an index. Recommendations and conclusions address each of the six objectives individually.

Sensitivity analyses are performed so that a variety of conditions can be addressed. The following dimensions are varied in these TERPS studies:

- Magnitude of load change
- Time frame of study
- Customer class responsible for load change
- Implementation cost of load change.

The load magnitude analysis demonstrates effects on the generation expansion plan and production costs. The time frame analysis indicates which strategies offer benefits in the short term, mid-term, and long term. Marketing programs can then be designed to pursue different strategies in different time periods. The customer class analysis should demonstrate how the revenue responsibility would differ for a given load change. The implementation cost analysis not only demonstrates the effects of high and low cost, but also addresses alternative rate making treatment to recover the cost. Thus, the sensitivity analyses yield not only "bandwidth" estimates for the evaluation parameters, but also information useful for designing load change strategies.

The base case study has already been completed within the traditional planning process. Case studies of the three load change alternatives are using the Marketing Planning Model (MPM), Generation Mix Program (GMP), and Demand Strategy Evaluation Model (DSEM, a variation of EPRI's Load Management Strategy Testing Model). The MPM is used to model the load characteristics for each of

TERPS: RELATIONSHIP BETWEEN "MEASURES OF EFFECTIVENESS" AND THE "OBJECTIVES" ADDRESSED

	REVENUE REQUIREMENT	ANNUAL RATE RELIEF	CUSTOMERS' TOTAL ENERGY BILL	CUSTOMERS' MARGINAL COST	EXPECTED UNSERVED ENERGY	RETURN ON EQUITY & CAPITALIZATION	CLASS SPECIFIC REVENUE REQUIREMENT ALLOCATIONS	FIXED COST COVERAGE	MARGINAL COST OF GENERATION
LOWER SYSTEM COSTS	●	●							●
ENHANCE COMPETITIVENESS			●	●	●		●		●
IMPROVE FINANCIAL INTEGRITY		●				●			
IMPROVE COMPANY'S CREDIBILITY			●	●			●	●	
RAISE EFFECTIVENESS OF CONSUMERS' TOTAL ENERGY BUDGET			●				●	●	
LOWER UNDESIRABLE IMPACTS ACROSS CUSTOMER CLASSES							●	●	

the three alternatives. The GMP is used to translate alternative load forecasts into modified generation expansion plans. The DSEM is used to translate alternative load forecasts and associated expansion plans into company and customer impacts.

4) FORECAST LOAD SHAPE IMPACTS

Instead of testing various specific demand-side programs to estimate the potential load shape impact, Southern Company first identifies desirable load shape alternatives and evaluates their relative merit with respect to the Company's objectives. At this point, the Company is not so much concerned with how to obtain the load shape change as it is with measuring the benefits of specific load shape modifications.

According to Southern's approach, altering the magnitude of load change affects the results of any other sensitivity analysis. That is, this one sensitivity dimension can influence or confound the effect of others, but not vice versa. In order to minimize the confounding, one load change magnitude for each of the three case studies has been specified as the nominal change case. The sensitivity analyses employ reasonable assumptions that are sufficiently different from the base case to provide useful insights. The "downstream" sensitivity analyses are all performed using the nominal load change magnitude. For further refinement of evaluation or of strategy design, investigation of sensitivities at varying load change magnitudes are warranted.

PHILADELPHIA ELECTRIC COMPANY

"INCREASING LOAD FACTOR BY PROMOTING HEAT PUMPS"

> "Through the practice of sound marketing principles based on service and value, we, as willing sellers, can again meet our customers as willing buyers."
>
> — *John H. Austin, President and Chief Operating Officer, Philadelphia Electric Company*

INTRODUCTION AND BACKGROUND

Heavier use of air conditioning compared to electric heating use has resulted in summer demands that are significantly higher than winter demand for the Philadelphia Electric Company (PECO). In an attempt to increase electricity use in the winter and thus raise its annual load factor, PECO has been promoting the installation of heat pumps to residential customers in its service area. Initiated in 1975, the program, sponsored by the Electrical Association of Philadelphia (EAP), combines extensive advertising with dealer training to stimulate heat pump sales and to ensure customer satisfaction on installation and service. EAP serves the five-county Philadelphia area and has a membership which includes utilities, electrical equipment manufacturers, distributors, dealers, contractors, and others involved in the electrical industry.

With strong industry support, two objectives were established: to educate the consumer on the benefits of the heat pump's potential energy cost saving and to train contractors to install and service heat pumps. A pilot training course developed in concert with Refrigeration Service Engineers Society began in 1975 and has now trained 231 technicians, representing more than 169 dealerships, in the installation of service of heat pumps. In addition, a multi-media advertising program using newspaper, radio, television, and direct mail promotion was used to inform customers of the benefits of heat pump installation.

PHILADELPHIA ELECTRIC COMPANY 1982 STATISTICS

TOTAL SALES: 26.2 Million Mwh

LOAD FACTOR: 56.8%

TOTAL CAPACITY: 8,006 Mw

SUMMER PEAK: 5,691 Mw
WINTER PEAK: 4,846 Mw

FIVE-YEAR PEAK LOAD GROWTH (1978-82): 0.1%
(Weather Corrected)

GENERATION MIX		**SALES MIX**	
PURCHASED (Mostly Coal)	36%	RESIDENTIAL	27%
NUCLEAR	33%	COMMERCIAL & INDUSTRIAL	59%
COAL	18%	OTHER	14%
OIL	9%		
HYDRO	3%		

While EAP manages the advertising campaign, PECO cooperates by:

- Contacting heat pump dealers and enrolling them in the program
- Providing a selected list of customers for direct mail promotions through EAP, directed to those people most likely to buy a heat pump
- Inserting EAP heat pump literature in utility bils each year
- Assuring that new heat pump customers are billed on the electric heating rate
- Participating in local trade and energy shows and builder conferences to provide information about heat pumps
- Planning, implementing, and staffing consumer heat pump seminars.

Direct mailings were made in May and October of 1982 to 200,000 customers who heat with oil. Oil assisted heat pumps were featured in the mailing, which contained a response card for a computerized heating energy cost analysis. After the card was returned, EAP mailed to the customer a computer printout of the annual dollar-savings potential realizable with heat pump installation, as compared to present fuel cost. The principal slogan of the campaign was *Join the Heat Pump Oil Reducing Plan.* This was illustrated by an oil-drum with a tape measure around its narrowed waist.

PECO representatives regularly participate in local builders' conferences to promote heat pump benefits, and to provide information on sizing and the special residential heating rate which is effective from October to May.

PECO anticipates a three percentage point increase in its present 57 percent load factor over the next 10 years because of overall load growth, heat pump installations in new houses, and increased heating sales through heat pump installations in the add-on fossil fuel furnace market. Targets were established at 52 percent of all newly constructed living units and 700 fossil fuel conversions to electric heat pumps. In order to meet these goals, PECO has organized a campaign of selected media advertising and direct public contact involving:

- A total of 990 60-second spots on radio stations in the spring and fall
- A special dealer listing in the Philadelphia and selected suburban Yellow Pages under Electric Heat Pump and Electric Home Heating category using the EAP heading
- Heat pump ads in the *Real Property News*, selected issues of *Focus* magazine, and the *Penjerdel Location and Market Guide*
- Fifteen 60-second spots, aired on a trial basis on public TV within the PBS pilot advertising program

- Six regional seminars for consumers where the cost/energy saving benefits are explained and participating heat pump manufacturers and dealers exhibit heat pumps.

PECO'S APPROACH TO DEMAND-SIDE MANAGEMENT ISSUES

1) ESTABLISH PROGRAM OBJECTIVES

Programs had been developed previously to create a customer awareness of the shortage of energy, and to give credence to the situation. New programs for 1982 offered alternatives to customers in their pursuit of the benefits derived from electric and gas applications. Ongoing programs also endeavor to encourage the installation of off peak loads to raise the system load factor and increase Company profitability. Future marketing philosophy will emphasize cost/value relationship of electricity as a solid benefit to the customer. The customer options strategy will be employed by continuing to emphasize that customers may choose any backup service for their heat pump and still be eligible for the preferential heating rate.

2) IDENTIFY ALTERNATIVES

One of the ongoing objectives of PECO is to tell customers of all the options that they have regarding energy use/cost. Along with participation in the National Energy Watch programs and consumer information and education programs, PECO customers have other alternatives. Rates include time of day residential, economic incentive rate for increases in manufacturing jobs, seasons, off peak demand, off peak energy, and interruptible rates. Conservation programs include home weatherization centers in urban areas, prolific Residential Conservation Service Audits, electric vehicles, solar and cogeneration expertise, and joint weatherization projects with community groups.

More comprehensive programs including loans and rebates are planned to increase available customer options.

The heat pump industry activity is only one of many programs in which PECO is involved to help customers get a better value for the cost of energy.

3) DETERMINE EVALUATION PROCESS

It was important to maximize both company and customer benefit in any demand side management program. Supporting heat pumps with gas or oil backup allowed PECO to take advantage of the large existing inventory of homes while allowing the maximum customer flexibility. Heat pumps gave customers large savings but also allowed them to maintain their present heating system. In addition, the preferential rate was given not only to all electric homes but to those with heat pumps and gas or oil backup. The program was sound in a conservation sense in that it provided greater efficiencies than resistance heating systems and reduced the nation's dependence on imported oil.

4) FORECAST LOAD SHAPE IMPACTS

As a summer peaking utility, PECO wanted to adopt a program to fill winter valleys and thus increase annual load factor. Emphasis on heat pumps with other backup sources help reduce needle peaks in cold weather.

5) DEVELOP MARKETING STRATEGIES

Direct Mail

Two hundred thousand consumer education brochures were sent by direct mail in the spring and again in the fall. The message was keyed to customers considering the purchase of a central air conditioner for a replacement or as an initial purchase. The brochures stressed the energy saving and economic benefits of the fossil-assist heat pump, as well as the conventional heat pump, in new construction.

Return coupons requesting information and fuel cost saving of the heat pump were included in all direct mail brochures, and a list of responding customers was provided to all participating dealers to aid their sales efforts.

Radio Advertising

Coinciding with the consumer brochure, appropriate radio commercials directed at the new and retrofit markets were aired on seven radio stations in the spring and again in the fall.

Some radio commercials sponsored by PECO exclusively were introduced. Market research comparing humorous vs. testimonial commercials led to the decision to continue with factual, testimonial messages.

Mini-Seminars

In addition to the radio and direct mail consumer education programs, PECO conducted a series of heat pump seminars, which were publicized by direct mail tailored to the various regions supplemented with local newspaper ads.

PECO, dealers, manufacturers, and distributors worked together in conducting the seminars offering the consumer an opportunity to see heat pumps in an exhibit and to talk with the manufacturers and dealers. Dealers reported very qualified leads and completed sales.

6) IMPLEMENT PROGRAMS

PECO generated an annual plan called "Commercial Operations—Energy Management Programs and Goals for 1982." This plan describes each of the current demand side management alternatives, including the overall program objective and the current measurable goal of the program. For the heat pump program, the 1982 objective was to conduct, through the Electrical Association of Philadelphia, an industry wide program promoting the benefits of the residential electric heat pump for both the new and retrofit markets, emphasizing the standard and the fossil-assist heat pumps in the conversion market. For 1983, the Company has implemented an incentive program known as EDGE (Energy Demand Growth Efficiency) management program for all field representatives and supervisors. The plan rewards meeting individual goals for various energy management programs which benefit both PECO and its customers. Incentives for stimulation of heat pump application is the most vital part of this program.

7) MONITOR RESULTS

As indicated in the table below, program results have come close to reaching established goals. At the end of 1982, there were a total of 29,769 heat pumps on the PECO system including 2,992 add-on heat pumps.

Accomplishments	Goal	Results	Percent
SALES			
Add-on heat pumps	700	657	93.9
CONVENTIONAL HEAT PUMPS			
Conversions	1,000	852[1]	85.2
New construction	3,000	2,331	77.7
Total	4,000	3,183	79.6

[1]Includes 657 add-on heat pumps.

Survey—Customer Respondents

A questionnaire was mailed to every customer who requested additional information. The objective of the survey was to:

- Determine how many of the customers requesting information installed a heat pump;
- Determine why they did or did not buy a heat pump;
- Assess the perceived value of the heat pump information received; and
- Determine the role played by the heat pump dealer.

Twenty-two percent returned the questionnaire. Of the *buyers* (those responding to "Why did you buy"):

- 47 percent said the information helped convince them to buy a heat pump
- 82 percent wanted lower heating bills
- 71 percent wanted central air conditioning
- 48 percent said the dealer was helpful.

Of the *non-buyers* (responding to "Why didn't you buy"):

- 47 percent said their present heating system was working fine
- 36 percent said there was no duct work in their present home
- 27 percent said installation costs were too high.

8) INITIATE ACTION

The Electrical Association of Philadelphia (EAP) referred to throughout this report is a unique trade association in that it truly represents all interests in the electrical industry in the Delaware Valley—the utility, dealers, contractors, distributors, and manufacturers. EAP speaks for the industry and has initiated one of the most successful heat pump consumer education programs in the nation and has set the standard for dealer training and testing internationally.

The team approach has been used to initiate action affecting all parts of the industry and this team approach is responsible for the results that have been achieved. This approach creates a forum whereby the entire industry is sensitive to changing market conditions; and it communicates these changes and the need to change strategies and goals.

Changing market conditions have shown that the oil situation is not what it was when the 1982 heat pump activity was planned and implemented. Because of this change, goals and strategies for the continuing 1982-83 activity have also changed. These changes include providing better qualified leads to the industry as sales aids. Point of sale materials now include dealer calculations sheets for them to use to show customers how much they can save with a heat pump. These leads are followed up closely by PECO field representatives to be sure that all the customers' questions are answered. The net result is that all segments of the heat pump industry continue to work together—the utility, the dealer and the wholesaler—to promote sales of the heat pump.

Senator Evans. Thank you very much.

Well, I think we have before us the people to reach some kind of conclusions, I hope, on whether we can get this legislation or not.

Mr. Honea, what is your estimate of the percentage of residences now that could well be served by the 50,000-Btu-or-less furnace?

Mr. Honea. Today, we estimate the market at 4 to 5 percent of the total market.

Senator Evans. What about the testimony, Mr. Morron, that as we look ahead to new homes, which are much better insulated, where energy requirements are seriously reduced and with the movement toward smaller homes, what do you anticipate that market will be?

Mr. Morron. I would agree with the assessment that the trend is in that direction but would conclude slightly differently that you therefore have more and more of the homes where we may be chasing the homeowner into a less efficient heating source, which is either the all-electric—electric resisting heating unit or the combination of a heat pump backed up by electric resistancy.

Senator Evans. Mr. Morran, why shouldn't this legislation be amended to set standards for electric resistance heating and for the heating cycle on heat pumps?

Mr. Morron. Mr. Chairman, if the intent of such an amendment were to be resolved in the very disagreement that has been raised before you today, I don't think we would have much difficulty with doing that. In fact, as late as last evening, at about 9:30, we were in conversation with members of the original consortium and others, suggesting that we would be willing to include in a rulemaking procedure from DOE heat pumps or space conditioning, actually, was the phrase that was being discussed. As long as the standard as proposed in the legislation was set and was in effect and that the DOE, in this instance, would determine whether a market segmentation was appropriate and, if so, what sort of a standard should be set, and in the event of a no-standard standard finding, that those standards contained in the legislation would then take precedence.

We don't see that that would give us great cause. We do not, however, wish to see with the disagreement you see before you today impede the progress of the other legislation.

Senator Evans. You said in your testimony, at least in your oral testimony, that resistance heating essentially was 100 percent efficient in the translation of electric energy going in to what comes out. And that is quite different than the testimony I think of Mr. Honea or others. And, of course, the difference, which I understand quite well, is the efficiency of the plant that generates the electricity that comes in. And there is a considerable difference between, I would guess, electricity coming to a resistance coil that is created from hydroelectric energy as opposed to a combustion turbine.

Mr. Morron. That is correct.

Senator Evans. Should a legitimate standard—if what we are after is energy efficiency, if we are trying to reduce the amount of energy used, should a standard, as relates to electric resistance heating, relate to the source of generation of that electricity rather than the resistance heating itself?

Mr. MORRON. The use of the source energy argument has been reviewed at not only the Federal level but in a number of State commissions and, frankly, they find it very difficult to deal with, as do I. Certainly, if your choice of fuel is electricity and your choice to implement that fuel for heating purposes is resistance, you run up against some very basic laws of thermodynamics against which no one can operate—or revoke, rather.

So, that if we are concerned with energy efficiency, I submit, as I did in my oral testimony, that electric resistance heating is certainly not the only option these customers have—and they are choosing others today—we submit that we would be willing to have space conditioning equipment as a whole be considered in a rulemaking procedure. And that would be inclusive of electric resistance heating.

Senator EVANS. But you don't think it is practical to try to relate that back to the efficiencies of energy production on the other end of the wire?

Mr. MORRON. No, sir; Senator Evans, I do not. I have been aware of this argument now for nearly 10 years and I have been dealing with it both as a member of an operating company in the State of Arizona and our State commission as well as here in Washington, since I joined EEI.

And I might point out that both companies I worked for in Arizona were combination companies, both gas and electric. I still have great difficulty in accepting that source performance argument.

Senator EVANS. You have great difficulty accepting it because it's difficult to figure out or for other reasons?

Mr. MORRON. Senator Evans, I really think it is virtually impossible to arrive at a number. And the reason I say that is it all depends on what kind of energy components you wish to include in your assessment of the source energy performance.

For example, are we including in source energy performance the energy that is necessary to make the steel that makes the drill that makes the bit that makes the rig, et cetera, et cetera, in order to tap to the gas in the first place.

Are we considering the energy expended by the diesel motor or what have you that is driving the drilling rig. In short, there is any number of ways that that source performance standard can be skewed either up or down to make a case or to blow it away. And both the American Gas Association and EEI have had experience doing just that.

Senator EVANS. I have listened to this argument before.

But it does seem to me that while that is true and you can trickle clear back to the first exploration, I would judge, at least from all the figures I have seen, by far the largest. And as you go down the line, certainly on the electrical side is the loss of efficiency from the generation of electricity and the line losses getting the electricity to the home.

Mr. MORRON. They are undeniable, Senator, and I am not here to try and deny them.

Senator EVANS. Mr. Honea, in your testimony you say it would cost $250 to get up to the efficiency, compared to the current small furnace, to get up to the efficiency that the bill would require, it would cost $250. But in the last page of your testimony where you have a series of tables and the various upgradings, that second upgrading would cost $220.

Which is it, $250 or $220?

Mr. HONEA. Senator, that is a bit of a glitch. I use the 250 number as a rough estimate before the AGA staff helped me to prepare that last table. And either number, we are dealing with ballpark figures and averages for a wide variety of equipment.

But taking the 220, I think you can see very clearly the steps that we think would have to be taken there. First, is a step to get automatic or electronic ignition, which you would get if you went to our 71 percent standard, and that would get rid of the standing pilot, which seems like a good move.

And then the second and biggest steps is the one we would like to try to avoid for these small furnaces is the addition of the power vent.

Senator EVANS. What percentage of small furnaces now being produced do not have electronic ignition and still depend on a continuing pilot?

Mr. HONEA. I am going to say about 50 percent. But I would like to get you some exact numbers, if I might.

Senator EVANS. All right. You might submit those.

What is your estimate for the future? What is happening now in terms of stoves, for instance? Aren't almost all modern stoves electronic ignition?

Mr. HONEA. Yes; I would think so.

Senator EVANS. Why haven't we moved to that? Certainly, it doesn't appear at least to me that electronic ignition for stoves can be a terribly expensive proposition. Is it for furnaces?

Mr. HONEA. I am sorry. I don't know the answer to why we haven't moved faster on furnaces.

Could I call on some help?

Senator EVANS. Yes; please.

If you can identify yourself for the record.

Mr. CUCCINELLI. My name is Ken Cuccinelli. I am vice president, marketing, with the American Gas Association.

Senator, you are absolutely right. Virtually all ranges now have electric ignition. And the trend has been upward in gas heating equipment. Just to take an example, in the equipment that is over 80 percent efficient several years ago, like 3 or 4, it was virtually negligible and it is now about 30 percent of furnace shipments are in furnaces, over 80 percent.

The cost of putting electric ignition onto a furnace would be about $100 is our best guess. So, to get to that 71 percent——

Senator EVANS. On the table it says $40.

Mr. CUCCINELLI. That is manufactured. But to the retail, we have got two levels there. The manufacturers tell us $40. We have used about double that number for what it ends up to be.

Senator EVANS. Well, what are your prices here? As you have them in the last table, when you say a good quality conventional atmospherically vented gas furnace, standing pilot 65 percent AFUE, $435—is that retail or manufactured?

Mr. CUCCINELLI. That is retail.

Senator EVANS. That is retail.

So, when you put the deltas in here, are those retail or are those manufactured?

Mr. CUCCINELLI. Yes; we did. Because we are——

Senator EVANS. Yes; what?

Mr. CUCCINELLI. Yes; the deltas are retail.

Senator EVANS. OK. But then you put $40 in retail for the electronic ignition which, frankly, sounds a lot more like what's closer to reality. And I don't know a thing about it except that we have got a gas range now that we moved back here. And every one of the burners has its own electronic ignition.

Mr. CUCCINELLI. I was just handed the sheet. I was going from memory. And the $40 number is a retail number.

Senator EVANS. OK.

So, $40 will take you from 65 to 71. How long does it take to recover that $40 in fuel deficiency, the fact that you don't have a pilot burning all the time?

Mr. HONEA. Senator, that is a very good payoff and we are recommending that one in our amendment, that we stay with 71 percent even for the smaller furnaces.

Senator EVANS. OK. That gets you 71 percent.

What about the next—is the only next step. Now, that takes you—you say the 78 to 85 when you have induced draft. Are there any other steps that increase efficiency from the 71 percent, the step one that you had there, other than the next step of induced draft?

Mr. HONEA. Senator, I am not a manufacturer or engineer as you are. But I think that becomes the basic next step that has to be taken.

Senator EVANS. In other words, you have to have an induced draft before you can get to the secondary heat exchanger?

Mr. HONEA. Yes, sir; and you seem to need the induced draft and the type of heat exchange that goes with it in order to get that next jump in efficiency, in any case.

Senator EVANS. Induced draft is really nothing much more than putting a fan in there to make the draft more efficient?

Mr. HONEA. Adding a fan and motor.

Senator EVANS. So, it is a fan and a motor?

Mr. HONEA. And modifying the heat exchanger itself just for the way the heat is exchanged from the gas to——

Senator EVANS. It sounds awfully expensive. Sounds like an awfully expensive motor and fan.

Mr. HONEA. I think we have—again, this is retail—and you do have the markups.

Mr. CUCCINELLI. Plus control, safety control. There has to be switching gear—and the manufacturers can give you the information on this—but the switching gear to make sure that it is operating properly to shut off the gas, if there is any venting problem and such.

Senator EVANS. Isn't that also true of a range?

Mr. CUCCINELLI. The difference with a range is that it is a supervised combustion. A person turns it on and there is visual contact. And with the furnace, it is remote. There is a point, though, that I would like to emphasize in the data here and something that EEI indicated.

Our concern is in the starter home—new family starting home, low-income housing, the multifamily housing—we have members that have indicated that 25 percent of their households make $15,000 or less. And they are worried that if the first cost of the replacement market increased such that people would postpone their replacements, they are worried about safety issues in those cases.

Senator EVANS. In earlier testimony in response to a question, however, there appears to be an increasing willingness of lending institutions to qualify buyers, especially buyers for these first homes, or a higher value home based on their income than would otherwise be the case, if that home is energy-efficient, because they legitimately understand that to run the home, you have to take into account both mortgage payments as well as the utility payments.

And if, in fact, there is a reasonable payoff, doesn't that qualify people for homes that otherwise couldn't think it?

Mr. CUCCINELLI. Most of those lending institutions deal with the structure of the house, the insulation levels. They are talking about—most of what we have seen deal with the structure, and they don't go into a fuel choice.

Senator EVANS. Oh, I think ones in Northwest are certainly taking a look at the various kinds of appliances and the whole ball of wax. I think that that's a legitimate and I think the growing way to look at things. In other words, it deals with the very fear that you have, that builders, other—people who purchase—will be looking unduly at initial cost rather than life cycle cost. And if the lending institutions start looking at life cycle cost, that, it seems to me faster than anything else, will cause the third-party purchasers or the builders to start paying attention.

Mr. CUCCINELLI. We agree with that. We would wholeheartedly agree with that.

Senator EVANS. Mr. Morron, can you try to tell me what the approximate initial cost of the resistance heating necessary to heat the same sized house as the $435—first, what size house, what are the specifications that lead to that $435 case? How big a house and what——

Mr. CUCCINELLI. We were taking a typical house of about 1,800 square feet.

Senator EVANS. 1,800?

Mr. CUCCINELLI. Yes.

Senator EVANS. And what weather conditions? Is this primarily heating only? It doesn't have any air-conditioning capacity connected with it, does it?

Mr. CUCCINELLI. That is right.

Senator EVANS. Heating only. And what kind of climate?

Mr. CUCCINELLI. I think the calculation was done on a U.S. average, which would have been 45 100 degree days.

Senator EVANS. Mr. Morron, can you tell me offhand—or maybe you would want to do it for the record—what would be the approximate initial cost of resistance heating for that same requirement?

Mr. MORRON. Senator, I would like to respond to your question about resistance in writing because I don't have, frankly, the foggiest notion. But I do have a notion about what it would cost to put a heat pump in a 1,000 square-foot home.

Senator EVANS. OK. Now, you said 1,800?

Mr. MORRON. Yeah. The heat pump—and we would be talking about the kind of 18.5-percent market share that we were discussing in my oral testimony, the 22,000 btu-an-hour model or roughly in that equivalent. And it would be somewhere in the range of $1,600 to $2,000 for a heat pump which, of course, would provide air-conditioning as well as heat.

Senator EVANS. Well, but that doesn't seem to me as comparable because to a simple furnace that is only heating.

But could you give for us the initial investment required for resistance heating for an 1,800 square-foot house, U.S. average, 4,500?

Mr. MORRON. Yes, we would be glad to.

Senator EVANS. I am just trying to get some idea of whether it is—you know, if I am looking for a cheapie and I have got to make a decision and I don't care what fuel costs—I am a builder—which way am I going to go currently?

Mr. MORRON. Along those lines, I think it is worth noting with respect to those installations of resistance heat that are taking place that it seems to us at EEI that the marketplace is moving away from electric resistance furnaces and more toward base-board insulations with individual thermostats in each room for energy-efficiency reasons.

So I would like to submit both those numbers, if that is all right with you.

Senator EVANS. That would be helpful.

Does your $435 include the cost of any necessary chimney or flue that would be required?

Mr. HONEA. No, sir.

Senator EVANS. OK. You better add that into that, if you could do that, and submit for us—in other words, I am trying to get some comparable initial cost and obviously if one has to have a chimney or flue and the other doesn't, that is a cost that has to be included.

Mr. Wiel, I have ignored you with this fascinating back and forth between the two industries.

Do you in Nevada or do any of the regulatory commissions or the utilities—I guess it is really the utilities—pay for efficiency and offer rebates or incentives? That is pretty generally used on the electrical side.

Are you aware of that happening as well on the gas side?

Mr. WIEL. It is not happening on the gas side in Nevada except for strategic marketing purposes by the utility company. But I have a——

Senator EVANS. Isn't it true at both sides, strategic marketing, it seems to me that covers precisely what they are doing, getting a better market share.

Mr. WIEL. There are debates that are going on right this very week and last week at hearings for Nevada Power Co., as to what degree the appliance rebates that they are talking about are for conservation purposes and to what degree they are for strategic marketing purposes.

But there are more specific conservation goals available on the electric side, at least in Nevada.

Senator EVANS. You did have a footnote, incidentally, some information that you had on the use of those incentives nationally. Could you supply those to us for the record?

Mr. WIEL. Could you be more specific, please?

Senator EVANS. Well, I think that you had a footnote in your testimony that related to the rebate programs and to what extent they are being utilized.

Mr. WIEL. Yes. I will be happy to provide copies of each of the three references in my report.

Senator EVANS. Thank you.

Mr. WIEL. The answer to your question about the gas conservation rebates, my understanding that in California those are being offered. But I have no specific knowledge of that.

Senator EVANS. Mr. Honea, are you aware of that kind of thing?

Mr. HONEA. Yes. Both of our industries do promote energy-efficient homes. We call ours the energy-wise home, and we do have promotional rebates for people that will build that type of home. I think that is good for energy efficiency for the country as a whole.

Senator EVANS. Do you have a program where you bring a third party in here, the oil-heating market—does the gas industry have a program of offering a real cheapie that would shift over the burner and kick out the oil and get in the gas?

Mr. HONEA. Some of the gas companies in the Northeast and the Midwest might. We do not. We have an inducement for new homes.

Senator EVANS. How much of an inducement?

Mr. HONEA. We offer a cooperative advertising program with the builder. And we can go up to $150 a home.

Senator EVANS. On the furnace itself or on the combination of gas appliances?

Mr. HONEA. It is the entire home, including the insulation, weatherization, and the appliances.

Senator EVANS. OK.

On your proposed amendment of 71 AFUE for furnaces rated less than 50,000 btu's, what future date do you feel that it would be appropriate for DOE to review that standard, if it were to be adopted? The legislation calls for reviewing other standards as required by legislation; how about this one?

Mr. HONEA. We would propose the same schedule. and I believe that calls for after initial enactment 5 to 7 years or 1997.

Senator EVANS. Do you feel that if we were to pass legislation that would lay on a requirement of 78 percent, that the industry would respond by figuring out a way to get the 78 percent cheaper than $220 a furnace?

Mr. HONEA. We would certainly hope so. And I know the manufacturers of the industry would dedicate themselves to trying to do that.

Senator EVANS. But you don't know at this time whether there are ways out there to accomplish that?

Mr. HONEA. Not being a manufacturer, Senator, I think the way they would have to do it, they would look for ways to attain economies of scale by making more and more of the same model that would give them labor savings, for example, tooling savings, which would reduce the unit cost hopefully to offset the cost of that extra fan and motor and whatever else.

Senator **Evans**. OK. Just look through here and see if I have run out of questions. I may run out of questions before I get you guys to all agree on what to do. I fear that that is going to be the case.

What about—we still have a difference of opinion here which doesn't bode well for legislation. Do you have an objection to the requirement that DOE considers there be no incentives for fuel switching when establishing small furnace efficiency standards?

Either side or both.

Mr. **Honea**. Would you mind repeating it because——

Senator **Evans**. Well, do you have any objection to a requirement that DOE consider that there be no incentives to fuel switching when establishing small furnace efficiency standards?

Mr. **Honea**. As I understand it, DOE would have a regulation that the utilities could not or the builders or the manufacturers or the dealers of equipment could not offer an incentive, in the form of a rebate or something like that, to attract someone to switch.

Senator **Evans**. Perhaps I am not sure how all the incentives might occur. But do I understand correctly that your concern, as it is expressed this morning is that a high efficiency standard for small gas furnaces might create an incentive for consumers to purchase electric resistance heaters rather than small gas furnaces; that is the concern, isn't it?

Mr. **Honea**. Yes.

Senator **Evans**. If there is some way to try to eliminate that incentive to fuel switching, doesn't that handle a concern?

Mr. **Honea**. I am visualizing a situation, Senator, where there is a new home being built and the builder, maybe in conjunction with the homeowner, is trying to make a decision. I don't quite see how one steps in there and provides a disincentive or changes the incentive. I am struggling with that.

Senator **Evans**. So am I. I am not sure, either. I am just asking questions.

Mr. Morron, do you have an answer?

Mr. **Morron**. Senator, I don't think I have an answer, but I have a suggestion to make that might help clarify matters. And that would be if DOE is to consider a separate standard, that the performance standard, per se, should not be fuel unneutral, should not favor either electricity or natural gas. In short, whatever standard would be produced or whatever number would be produced would be fuel neutral.

That then would leave the question of the relationship of the individual companies and their customers and builders and their potential customers alone and essentially out of the question, if the standard were done on a fuel neutral basis.

Senator **Evans**. OK. But I think that is my whole line of questioning during this is try to figure out what is or isn't fuel neutral, even from the estimates of fuel pumps——

There are two ways to look at it. One is the total life cycle cost, and the other is the initial investment. I guess what we are saying is that a lot of people really don't look and they do not act, necessarily, in their best economic interests because they don't look at the total life cycle cost, or a third party is the one who is building the house and opts for what is of interest to that person, which is only the initial capital cost.

If that is true, your heat pump isn't going to be a competitor for that size home with the simple gas furnace, in terms of initial cost. Three to four times is expensive; right?

Mr. MORRON. Mr. Chairman, if I might. I heard the discussion earlier this morning about whether or not that energy customers are looking at the long-term implications of an appliance purchase. I heard the testimony that suggested that first cost was the only consideration. And I would like to substantially disagree with that assumption if for the only reason that at least my industry in the past 10 or 12 years has dramatically gotten the attention of its customers over the issue of energy costs.

I don't think first costs are the overriding consideration. I truly believe that as our prices as an industry have increased over the years, our customers have become increasingly sophisticated in the way they decide to purchase an appliance and are, in fact, conscious of first cost but willing in some cases and probably most cases—now, I don't have numbers or whatever to suggest that—but in most cases are willing to spend a little extra because of the long-term implications of energy savings, but most especially with energy-intensive equipment, such as refrigerators and HVAC equipment.

Senator EVANS. Well, that may be true, but let's look at the—it seems to me the biggest market and especially when we are talking about furnaces—heating and cooling a home—aren't purchases made after the home is built? There are purchases that go along with the building of the home.

And so a person goes out to buy a home. Where does that rank in their thoughts about the home? It seems to me that view, neighborhood schools, size, number of bedrooms, bathrooms—everything else under the sun—they look at the whole picture. And I frankly doubt that the question of whether there is an electric resistance heat or small gas furnace is going to be a big factor in their determinations as to whether they buy the home or not.

Mr. MORRON. With due respect, Senator, I would disagree. And I think if I could drag somebody in here from the National Association of Home Builders to talk to you about their last buyer preference and behavior study, they would agree with me when they—I think they would say to you that energy efficiency is still in the top five factors in the purchase of the home, including location, number of bedrooms, and so forth.

Senator EVANS. I would be fascinated.

Mr. WIEL. Mr. Senator, may I respond to that last question?

Senator EVANS. Yes. In fact, I am sorry.

Do you have those rankings available?

Mr. MORRON. Yes, I believe they have been published, Senator. I think we have them back in the office somewhere.

Senator EVANS. If you can run across them or if we can get them, I think they would be useful to help Mr. Wiel.

Mr. WIEL. The third reference in my written testimony addresses the efficiency of the market and it specifically answers—at least tries to answer—some of your questions.

It is a study done by Lawrence Berkeley Laboratory to be published later this year. But I do have a copy of the paper that was submitted. In fact, I have one here, if you would like to take it today, or I will submit it as your pleasure. It contains, for example, some information on the number of third party producers.

A study was done for LBL which showed that 50 percent of the purchases are purchased by people with what they label as a weak incentive to consider energy prices.

Senator EVANS. That is all appliances. Do they separate them all by appliances?

Mr. WIEL. No, they refer to another study and they summarize this. I don't know whether the reference behind this reference contains that separated or not. Fifty percent of all appliances are purported to be purchased by people with a weak incentive, to consider energy conservation.

Thirty seven percent are purchased by people with no incentive and 15—I am leaving something out, but 15 percent are purchased by people with a strong incentive. Let me read you the correct numbers because it is right here. Those are the numbers: 37 and 15. I don't understand why they don't add up. The other 8 percent aren't referenced.

Furthermore, the prime purpose of this study was to look at, from a macro point of view, the overall investment behavior in appliances of the Nation as a whole, and it does it by looking at the opportunities that the purchasers don't accept. They look at the next purchase turned down and what it could have been. And they are showing that people are avoiding opportunities to return from 18 to 825 percent on an extra investment and they are doing it for a number of reasons.

They are not commenting on the individual's decisions. They are saying the marketplace could offer that opportunity, not that it does offer it, but it could offer the opportunity for those returns in the marketplace isn't and instead people are accepting 12 percent return on these billions of dollars by investing in powerplants instead of the appliances.

Senator EVANS. I think both sides tended to agree that there ought not to be in the standard set, whatever we pick, particularly in this field where there appears to be some difficulty, there shouldn't be an incentive in the standards themselves to push people one way or the other.

If we found that—I am not saying we will, but to get to 78 percent that we are talking about, 78 to 85 percent, you have got a $655 bill and it may cost another, say, $150 to build the flue; say that gets you up to $805.

If legitimate analysis showed that the cost of electric resistance heating for that same sized house to install was $805, wouldn't that be a neutral, no incentive either way, and be a legitimate——

Mr. HONEA. Senator, firstly, we are assuming that, which I think would be way off. I think you would have $200, $250 for the electric instead of——

Senator EVANS. That could well be.

Mr. HONEA. But let's assume—you want to assume that it is equal. I think, then, we would argue to go back to the source and look at the efficiency of the fuel that is being used, from a national perspective.

Senator EVANS. Well, how do you do that? What is the efficiency of gas?

Mr. HONEA. Well, I think the problem we have there is that we would maintain that the electric resistance heater is not as efficient for the nature as a whole. But I don't know any way to put a penalty on it, if you will, to stop its sale and use.

Senator EVANS. You are saying it is not as efficient simply because the generation of the electricity in the first place is that X percentage efficiency and their line losses to get it from there to the house.

Mr. HONEA. That is right, sir.

Senator EVANS. But isn't the same thing true, the argument from the other side, that if you—and I have seen some analyses that have attempted to do this, to get the whole energy train going clear back to the first punching of a hole for a gas well and the first building of a dam for a hydroelectric plant. I guess it would be a fairly complex operation. And I don't know whose side wins on that.

Mr. HONEA. We think that the overall efficiency on the electric resistance might be as low as 33 percent. And I will be glad to get you some numbers from the AGA studies on the gas. But I believe the gas is much more efficient in getting it to the home, from the well to the home.

Mr. CUCCINELLI. Senator, right now electric resistance heat is less expensive to install than a natural gas furnace. The concern is that the bill is widening that gap; and if there was—I think if you were——

Senator EVANS. If it is less expensive, why does anybody put in a gas furnace?

Mr. CUCCINELLI. Initial cost, comfort. There are several other issues.

Senator EVANS. But initial cost isn't one of them, if you are saying that it costs more?

Mr. CUCCINELLI. In most applications, that is yes. But the delta is very close. And what this bill could do is widen that cap and cause some serious marketing problems.

Senator EVANS. Do you have any estimate at all as to what you really think would happen if a standard like this were adopted in the $220 that you now say is required, to add a draft, what would really happen in the marketplace? You are not going to sit by and let the market go away. You always will do everything you could to reduce that cost.

What is really going to happen? It is not going to be $220. It is going to be some figure a lot lower than that, I would guess.

Mr. HONEA. We would hope. The first attack would be the manufacturing level, and we would hope that at that level and through the distribution channels, that could be narrowed. But I am worried, Senator, that what we are seeing right now is a lot of decisions are being made, based on first costs, contrary to what my colleagues have said, and we are already fighting that battle today. People that are buying these homes with the less efficient type of energy and then being shocked with high bills, and I don't quite see how we can offset the cost of that extra motor and fan and the other controls that go with it, and I fear that while we may reduce that $220, we are still going to be seeing a widening spread.

Mr. MORRON. Mr. Chairman, the Electric Institute and its members see no great rush on the part of homeowners in the United States today to move toward resistance electric heating. Quite the contrary. We see an increase in penetration of the heat pump application of electricity for home-heating purposes.

In those high-growth areas, as one might call the South or Sun Belt as defined by the Census Bureau—in fact, we are only seeing a 6-percent penetration of resistance electric heat. So, I don't see the rush that my colleagues on the gas side of the business see.

Senator EVANS. Well, 6 percent. Now, what they are saying is if you increase the cost of the competitive furnace by 50 percent, that the penetration will be a whole lot bigger.

Mr. MORRON. Well, Mr. Chairman, my response to that is that where the growth is taking or the new construction is taking place, as I mentioned earlier, we have an increasing penetration of air conditioning which requires duct work. And at that point the competition is not really between resistance electric heat, which is perceived by the consuming community as an extremely expensive thing to do. And gas furnace—it is a difference between an electric air conditioner and a gas furnace or a heat pump.

And I think that is where the battle is today, and I submit that unless we do something arbitrary through this legislation with respect to standards, that is where the competition is likely to go in the future.

Senator EVANS. Have you worked on some gas-operated heat pump operations?

Mr. CUCCINELLI. There are a number of gas-fired heat pump technologies and field tests right now. But there aren't any into the marketplace. And we don't know what the technical success of those field tests would be. So, that is the best guess.

Another point is the gas furnace was basically the only appliance of all the appliances that took out a tried and true technology, the atmospheric furnace, which there are 30 million or so of them in use operating very well and successfully and are eliminating that technology at a time certain in 1992.

And, basically, the bill then asked the Natural Gas Utility Industry to place all of its marbles on a future technology and future development that isn't quite here today. And having seen what happened to our counterparts when they put a lot of marbles in plant construction based on atoms, we decided that it gives us uneasiness just based on betting on something that isn't here now and it is playing, bet your industry, in essence.

Senator EVANS. But that presumes—when you say it will eliminate, you are presuming that, from the cost figures you have here, or whatever the cost figures end up being, that you won't be able to compete, you won't be able to discover anything, you won't be able to operate.

Mr. CUCCINELLI. What I am saying is when you set the number at 78 percent, you eliminate the atmospheric combustion furnace, and that is a whole class of furnace that presently is 66 percent of the shipment, something like that, total shipment.

And that is the only appliance that has had its shipments gutted like that, and you are taking that whole technology, tried and true, and saying goodbye; we are going to try and develop new technology, bring the cost down on some technology that is in the marketplace.

And so it is a risk that we are being asked to take, too.

Senator EVANS. It has been a very interesting and worthwhile exchange. We are still a short distance from the end of the session. There is a very large group that would like to see some standardization come out of what we are going to do. The penalty for not doing anything, of course, is to have the Department of Energy and the courts decide what the future will be and I do not think that either or both of those are necessarily to be desired.

Mr. CUCCINELLI. Senator, we were involved in the late night negotiations also last night, and it was our understanding as of last night that the manufacturers did not want appliances to be separated out, if possible, to DOE ruling which would then have the State exemption because it makes moot the initial objective that they had for a Federal market.

And it was my understanding that that stipulation by EEI was causing the manufacturers some concern, and hence our proposal in our testimony would be consistent with the primary objective and goals of the manufacturer of having a Federal market.

Senator EVANS. Which one? The first or the second alternative? Either of the alternatives or the first alternative?

Mr. CUCCINELLI. The first alternative complies more with that objective.

Mr. MORRON. Mr. Chairman, there is something in what Mr. Cuccinelli says here. Amongst all the proposals that went back and forth amongst us last night, I think it is worth noting what I was told by—we were working through intermediaries because I knew if I proposed something to Ken, he was going to see it tainted with the electric brush and so forth.

Senator EVANS. Why don't you eliminate the intermediaries and just get together?

Mr. MORRON. That is right. Well, sometimes what makes logical sense does not really work out. But in this case what the manufacturers were expressing to EEI as their concern with the proposal that I advanced here this morning was that in the case of the 45,000 Btu per hour and below gas furnaces, this would delay the date certain that they, as manufacturers, would be able to plan for by 1½ years over that which is currently contained in the legislation.

EEI's position with respect to their concern was to share it and to understand the agony of regulatory delay but to point out to them that we felt very strongly that unless we could reach some sort of an agreement, this bill was likely to get fouled up somehow and go down. And we wanted those standards established, essentially saying to both the House and the Senate that there is no reason for either of you at this point to believe Mr. Cuccinelli or myself, and why don't you resolve this difference in the hands of energy professionals in the Department of Energy.

And that, last night at 10 o'clock seemed to satisfy the manufacturers. Now, perhaps there have been subsequent communication that would reverse that, and I would not doubt it a bit. But that is where we were last night.

Senator EVANS. Any comment from the other side?

Mr. Cuccinelli. It was just my understanding as of a few minutes ago that that was a problem with the manufacturers.

Senator Evans. I guess we need to go back to the drawing board for at least a few finishing touches, or at least to find out kind of where everybody is.

We do appreciate your testimony and the help that has been given. There is not much time left and there may be some who prefer to have the courts set the standards which they most certainly will do because I do not see DOE moving very fast to accomplish the task.

I greatly admire the judiciary. I think that they are marvelous to settle court cases, but they are not very good at either legislative or executive action, which is what they are being asked to do here.

OK. Thanks very much. With that, there is no more testimony. The hearing is adjourned.

[Whereupon, at 12:48 p.m. the hearing was adjourned.]

[Responses from the Natural Resources Defense Council and additional statements for the record follow:]

Natural Resources
Defense Council

25 Kearny Street
San Francisco, CA 94108
415 421-6561

RESPONSE OF THE NATURAL RESOURCES DEFENSE COUNCIL
TO QUESTIONS SUBMITTED BY THE
SUBCOMMITTEE ON ENERGY REGULATION AND CONSERVATION
SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
ON S.2781

September 23, 1986

David B. Goldstein, Senior Staff Scientist
and David B. Edelson, Staff Attorney

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Question 1. From the point of view of manufacturers, it was the objective of establishing national standards and avoiding numerous State standards that was the incentive to negotiate this legislation. However, under last year's court decision DOE would establish national standards through rulemaking. Why do you prefer this legislation over allowing DOE to set national standards by rule?

This legislation provides several benefits compared to a DOE rulemaking. First, it provides standards at an earlier effective date then would be likely to occur under DOE rulemaking. Second, establishment of standards today allows increased certainty in forecasting the need for new power plants and fossil fuel supplies that can guide utility and producer investment decisions this year, rather than allowing several more years of making investment decisions that may prove to be erroneous. Third, in establishing standards through consensus legislation, the risk of litigation is avoided and increased assurance that the standards can go into effect is provided. Finally, establishing standards uniformly on the national level avoids wasted time and effort in debating this issue in fifty states.

Question 2. T.V.'s and humidifiers and de-humidifiers were defined as "covered products" under the Energy Policy and Conservation Act (EPCA), but are not under this legislation and pool heaters have been added. Could you please explain the rationale for these changes?

Televisions were inadvertantly omitted from S.2781 as introduced; they are included as covered products in H.R.5464 as passed by the House. Under the House bill, DOE is authorized, but not required, to set standards for televisions. Pool heaters are added to the list of covered products because of their very large conservation potential in those homes that make use of this product. A pool heater may consume more energy than all other uses combined for the household that owns that product. Humidifiers and de-humidifiers are omitted from this legislation because the coalition supporting this legislation believes that the energy conservation potential for these products is much smaller than those of the other listed products, so that rulemaking for these products should not be congressionally mandated but could be conducted if needed by DOE under Section 325(i) of the bill.

Question 3. The Subcommittee has been contacted by interests who have expressed concern regarding the efficiency requirement for small furnaces (less than 50,000 Btu/hour). They believe that the requirement of 78 AFUE will increase the first cost of these units enough to stimulate customers to buy alternative heating equipment -- such as electric heaters.

What is your estimate of the size of the market for such units?

What is your estimate of the increased cost per unit to meet the proposed standard?

Do you have any suggestions on how the legislation could be modified to meet these concerns?

It is the belief of NRDC that the requirement of 78 AFUE for all furnace sizes will have no material effect on the competition between gas and electric heating equipment. We are somewhat baffled at the high degree of emphasis that has been placed on these products by some utility companies. We believe this emphasis is based more on irrational fears of change in the status quo than on any rational analysis. NRDC believes that neutrality between different fuel sources is a reasonable goal for appliance standards, but that there is virtually no risk of this goal being compromised by a requirement of 78 AFUE.

The size of the market for units smaller than 45,000 Btu has been estimated by GAMA to be about 2 1/2%, while the market for 50,000 Btu or less is less than 7%. This fraction is expected to grow in the future, but we do not believe that it will increase drastically.

DOE estimated in 1983 that the increased cost for a 100,000 Btu furnace to meet a 78% standard is about $200 in current (1986) dollars. This is the cost to the consumer; the cost to the manufacturer is estimated at about $90. These figures drew little, if any, adverse comment during the DOE proceeding, and were considered relatively non-controversial. The cost increase for a 50,000 Btu or less furnace would be somewhat lower than these figures because the furnace size is smaller.

The actual cost to the consumer could also be affected by competitive forces. With central air conditioners as well as furnaces, consumer prices are established not only by manufacturing costs but also by competitive forces. For example, the mark-up on "builder model" low efficiency central air conditioners is much lower than the mark-up on high efficiency "upper middle-class" choices. This is because suppliers are forced to reduce costs to compete in the builder market. One would expect that if market resistance to the increased costs of a 78 AFUE furnace were found in a given locality, prevailing retail prices would drop to rectify this imbalance and reestablish an equilibrium at approximately the current market share.

The increased first cost of a 78% AFUE furnace pays back to consumers very rapidly. The following calculation describes the cash flow to the consumer of purchasing more efficient equipment.

Costs. As a conservatism, the DOE cost to the consumer of the 100,000 Btu unit ($200) is used in the analysis. Actual costs for a smaller furnace would be lower although not proportionally lower.

Savings. The savings are calculated as follows: a 50,000 Btu input furnace with a base case efficiency of 71% (approximately the current average) has an output of 35,500 Btu/hour. In order to have the same output, a furnace with an efficiency of 78% would require an input of only 45,513 Btu/hour. The reduction in input rate, 4,487 Btu/hour, is multiplied by annual furnace usage hours and the price of gas to arrive at an estimate of cost savings from the more efficient unit. Using DOE's estimate of 2000 hour/year, this results in an annual estimated savings of $53.85/year. For southern climates such as Dallas or Atlanta, the DOE test procedure specifies 1000 hours/year of furnace use, so savings would be $26.92/year.

Payback period. The major area of concern for the small furnaces is the new housing market; these products are generally too small to serve existing houses. For the new housing market, increases in furnace efficiency are financed through the mortgage loan. In this case, the 78% furnace results in a cash flow payback in less than four years in the southern climate zone.

This payback period is calculated in Table I as follows: The mortgage costs for an 80% loan for a purchase price of $200 financed at 10% over 30 years is $16.85/year. The downpayment is $40 the first year. Mortgage costs are continued for the future years. Energy cost savings are assumed to increase 6% per year, a lower rate than projected by DOE. Total costs in savings are provided in Table I below.

TABLE I

	Costs	Savings	Net Cash Flow
First Year	$40+$16.85=$56.85	$26.92	-$29.93
Second Year	$16.85	$28.53	+$11.68
Third Year	$16.85	$30.24	+$13.39
Fourth Year	$16.85	$32.05	+$15.20
Cumulative Cash Flow, Four Years			+$10.44

As shown in the table, the cumulative net savings after the first four years for the mild climate zones is $10.44. Total net savings for colder climates would be significantly greater.

This calculation underestimates net savings because it does not account for the fact that a furnace rated at 71% efficiency using the DOE test procedure (conducted for 2000 hour/year) would actually have a lower efficiency at 1000 hour/year. This effect would not occur for the higher efficiency furnace, where the steady state efficiency and the cyclic efficiency are nearly equal.

With respect to specific legislative language, NRDC endorses the existing language in S.2781 or the language in H.R.5464 as passed by the House.

Question 4. This legislation would add several new definitions to the law, such as:

"annual fuel utilization efficiency",
"efficiency descriptor", and
"energy efficiency ratio".

However, there are other terms in the bill which are not specifically defined, such as:

"energy factor" (p. 19)
"packaged terminal heat pump" (p. 5),
"national voluntary consensus standard" (p. 45),
and "rating conditions" (p. 4).

Are manufacturers, environmental interests and the Department of Energy in agreement on the meaning of these terms or should definitions be included in either legislative or report language?

Would you please provide the Subcommittee with definitions of these terms for the record?

The intention of providing definitions was to lock into place current DOE definitions so that a subsequent change in definition would not affect the level of stringency of the standards. There is little disagreement among the interests supporting this bill on the use of current DOE definitions in interpreting the meaning of the provisions of the act.

Question 5. Typically, a law may require persons to make a "showing" in order to trigger a specific finding. However, this legislation would require a person to "establish by a preponderance of the evidence." Could you please explain the reasons behind the use of this phrase?

The phrase "preponderance of the evidence" is commonly used to describe the burden of proof that applies in civil litigation. By imposing this burden on interested parties, the bill requires interested parties to submit sound and reliable evidence and requires DOE to determine that the party with the burden has demonstrated that a proposition is more likely than not to be correct. DOE would be required to weigh all evidence offered by all parties in making this determination. The term "preponderance of the evidence" is used in order to impose a heavier evidentiary burden than would exist under a requirement that a person merely make a "showing."

Question 6. To receive a waiver during the initial "lock-in period of a standard, a State would have to establish that, "because of circumstances not reasonably foreseeable by the State, an energy emergency condition exists within the State..."

It seems to me that in the event of an "energy emergency condition" the issue should not be whether-or-not it exists. Would the coalition have any objection to deleting the requirement that such a condition be "reasonably foreseeable"?

NRDC does not object to this change on the understanding that it is acceptable to all members of the coalition.

Question 7. I understand that the language regarding the standards for boilers has been modified by the House Subcommittee. Would you please explain the change?

The modification in language concerning boilers is a technical change to reflect the same level of efficiency as measured by a slightly different test procedure. An 80% efficiency for a boiler using the indoor test procedure is intended to be precisely equivalent to a 78% efficiency standard using the test procedure provided in the Act for furnaces.

Question 8. Would you please explain the intent of subparagraphs (C) and (E) on pages 46 and 47 regarding State building code requirements?

Have you received any comments from States on these provisions and, if so, what were they?

The intention of subparagraph (C) is to ensure that the tradeoff allowances in an energy conservation building code do not constitute a back-door attempt to raise the minimum appliance efficiency standard. For example, a State could assign so high a value of credit for the use of efficiency levels in excess of those in the Act that it would effectively require such higher levels of efficiency. The Act would prevent a State from adopting such a provision.

The intent of subparagraph (E) is also to prevent the establishment of a de facto higher efficiency standard through the use of optional combinations. For example, a building code that established 12 optional combinations, only one of which had an efficiency equivalent to the national minimum and the others of which had the same higher efficiency would make it difficult for a builder to use the package with the national minimum efficiency, and this would have the effect of requiring the use of the higher efficiency equipment.

Informal comments from States on the building code provisions has generally been mildly negative. States would prefer to have unrestricted ability to set equipment efficiency levels in their building codes, and in some cases are concerned about the extra analytic effort that would be necessary to meet the requirements of Section 327(f). The coalition felt that accommodating further these state concerns would defeat the intended purpose of providing a desired level of national uniformity in building code appliance regulations.

Question 9. On page 13 of the legislation, regarding amendments to the test procedures, the language reads that the Secretary shall measure "energy use of a representative sample of covered products that minimally comply with the existing standard." Please explain the use of the word "minimally" (It appears to confuse the intent that a "representative sample" be used)?

The purpose of the paragraph in question is to ensure that a change in test procedure will not change the stringency of the standard. The best way to determine a new energy conservation standard that achieves this result is to measure, under both the existing and amended test procedures, the efficiency of a representative sample of units that are exactly at ("minimally comply with") the level of the existing standard. The intent of the phrase "minimally" is to cover the situation where the required minimum efficiency level is 10, but where there are no or very few models with an efficiency of exactly 10. In such case, DOE should measure the efficiency of a representative sample of models that "minimally comply" with the standard, e.g., those with an efficiency of 10.1 or 10.2.

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CALIFORNIA 95814

September 3, 1986

The Honorable Daniel J. Evans
United States Senate
SH-702 Hart Senate Office Building
Washington, D.C. 20510

Dear Senato~~r Evans~~: DAN

The California Energy Commission is pleased to support the proposed National Appliance Energy Conservation Act of 1986. Over the last ten years the CEC's appliance efficiency standards have been an important element of California's energy policy. These standards save more energy than any other conservation program in the State, and are extremely cost-effective for our ratepayers. We believe that this bill will achieve similar savings for consumers nationwide.

We understand that this bill is the result of intense negotiations, and that the explicit trade-off was national standards for stronger preemption of state standards than exists under current law. We have thought seriously about the new exemption criteria, which significantly reduces the states' ability to set standards, and weighed them against the benefit of nationwide conservation. We conclude that the trade-off is worthwhile.

We believe that the Legislative History of this bill should reflect the fact that the intent of the bill is to make it tougher for states to set standards than under current law, not that all standards are intended to be preempted. California is willing to accept the tougher criteria, but feels that future circumstances could warrant State standards. Including a discussion of the intent of the preemption criteria in the Legislative History would ensure that this bill does not preclude the possibility of state standards. We have attached proposed language.

The California Energy Commission looks forward to supporting your bill actively in Congress.

Sincerely,

Charles R. Imbrecht
Chairman

9/3/86 - California Energy Commission

PROPOSED LEGISLATIVE HISTORY LANGUAGE REGARDING FEDERAL PREEMPTION PROVISIONS

Section 327

This section is designed to protect the appliance industry from having to comply with a patchwork of numerous conflicting state requirements. It is also designed to ensure that states can respond with appliance regulations to substantial and unusual energy problems, such as high electricity, gas, or heating oil prices, high dependence on oil (or fuels whose price is tied to oil) for electricity generation or on out-of-state energy sources, unusual climatic conditions, or adverse environmental or health and safety conditions, or adverse environmental or health and safety conditions that can be alleviated by energy conservation in appliances. Congress intends that the Secretary will carefully consider such potential benefits of state or local regulations and weigh them carefully along with potential burdens to the appliance industry when determining whether to grant exemptions from preemption. Congress anticipates that states that have such energy problems, and that have competently analyzed the factors called for in Section 327, will be granted waivers.

CONCERNING THE BILL TO AMEND THE ENERGY POLICY AND CONSERVATION ACT WITH RESPECT TO ENERGY CONSERVATION STANDARDS FOR APPLIANCES

ENTERED INTO TESTIMONY
BY THE
FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS
SEPTEMBER 23, 1986

Recently, the American Refrigeration Institute and the National Resource Defense Council were successful in having legislation introduced in Congress to establish minimum appliance efficiency standards nationwide (House Bill HR 5465; Senate Bill S 2781). The purpose of this testimony is to share with you some of our concerns regarding this legislation.

The Florida Department of Community Affairs, which promulgates and has administered the Florida Energy Efficiency Code for Building Construction since 1980, has been supportive of similar appliance efficiency legislation at the state level during the past three Legislative sessions. While we are in philosophical agreement with Senate Bill S 2781, we have several concerns regarding its effect on current state-mandated energy conservation programs in Florida.

The major functional problem created by the proposed legislation is the restriction placed on energy efficiency building codes. While we concur that minimum appliance efficiency levels should be those established by national consensus or federal standards, we do not agree that performance levels for new homes be based on the minimum appliance efficiencies established. Florida's Energy Code presently allows equipment with minimum efficiencies established by national consensus standards to be installed and it also provides a variety of ways in which homes can meet an annual performance energy budget based upon calculations which include cost-effective options. The proposed appliance efficiency bill would prohibit the Florida Energy Code from basing a home's overall performance on an equipment efficiency level that is established to be cost-effective to the consumer, as is our statutory mandate (Sec. 553.901, F.S.). Further, such a requirement could mean that building performance levels established by energy efficiency building codes will lag behind technology by five to ten years rather than keep pace in a responsible manner. Therefore, we are opposed to any part of the legislation which restricts the efficiencies of covered appliances used to develop baseline building designs.

A second provision which we oppose is the requirement that all credits given toward compliance with the energy code must be on a one for one equivalent energy use basis. The problem with this provision is that it precludes the historical practice in Florida to provide incentives and penalties for different technologies. Of key importance to the state is the issue of how specific technologies impact the peak power demand on the electric generating system. An example of how an incentive which is not based solely on energy consumption but rather the effect on peak demand, would be a credit given to gas space and water heating systems. Gas systems actually use more energy at the site and are less efficient. But, they also reduce the need for additional electric power generation capacity to just meet peak loads. The generating capacity to meet peak load demand has been identified as the major issue in power generating requirements for the state and is one all state agencies as well as electric utilities in Florida are working to contain.

Other provisions of the proposed bill limit our ability to administer and revise the Florida Energy Code which is one of the state's primary tools for energy conservation.

In summary, we consider this bill to be a potentially positive step toward a more energy efficient and, therefore, stronger society. Our problems with the legislation stem from the requirements placed on energy building codes which limit the flexibility of Florida's code. The overall evaluation from the Department's perspective is that this is a good bill that would be much better without the language which extends so far into energy codes.

EXPLANATION OF THE FLORIDA ENERGY EFFICIENCY BUILDING CODE'S TREATMENT OF APPLIANCE EFFICIENCY IN NEW BUILDING CONSTRUCTION

New buildings constructed in Florida that are heated or cooled must demonstrate compliance with the Florida Energy Efficiency Code for Building Construction (hereafter called the Florida Energy Code) before obtaining a building permit. The Florida Energy Code is a statewide uniform code. It provides a uniform standard for thermal efficiency by regulating the design of the building's exterior envelope and the selection of energy-consuming heating, air-conditioning and water heating systems for the building. Florida law requires that the Department of Community Affairs, at least biennially, determine the most cost-effective (to the consumer) energy-saving equipment and techniques available and update the code to incorporate such equipment and techniques.

Space heating and cooling and water heating appliance efficiency minimums are set in the Florida Energy Code at levels consistent with the national consensus standard set in the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90-80. This was done in a deliberate attempt to attain a level of uniformity in equipment efficiency with that of other states in the absence of federal standards and to set minimum levels consistent with the industries' consensus. Those minimum levels (see Tables 1 through 4) were set in 1980 and are, in most cases, presently below the minimums set by the marketplace. It is this Department's policy to reference and maintain national standards whenever possible.

Residential construction may comply by either Section 9 or Section 10 of the Florida Energy Code. Section 9, the Residential Point System Method, is a performance-based energy use comparison of a house as it is planned (the "As-Built" condition) with a "Baseline" or theoretical home of the same configuration. The baseline calculation includes optimized insulation and equipment efficiency levels that have been determined to be cost-effective to the consumer. A baseline energy budget is established for the home by calculating the energy it would use for heating, cooling and water heating if the optimized Baseline levels were installed. The As-Built home need not meet all of the baseline levels but must demonstrate through the compliance calculations that the annual energy use would be less than what it would have been if they were installed. This holistic approach allows the builder a variety of marketing options. Section 10, the Alternate Prescriptive Compliance Method, provides a number of packages of insulation and equipment options, commonly installed by builders, that meet the energy budget set by Section 9.

The minimum equipment efficiency levels allowed by the Florida Energy Code are based on Federal or national consensus standards and not on cost-effectiveness. The Baseline equipment efficiency levels in Section 9 of the Code are typically higher than the minimums but reflect levels which are more cost-effective to the consumer (see Table 5). They are used to determine the energy budget established for the Baseline house. Efficiency levels less than baseline down to the minimum may be installed. However the overall estimated energy use must not exceed the baseline energy budget. The proposed requirement that appliance efficiencies used to establish baseline energy budgets must be equal to the federal minimums would prohibit the state from using efficiency levels which may be more cost-effective.

The appliance efficiency levels specified in Section 10, the prescriptive compliance procedure of the Florida Energy Code, are not minimums which are allowed to be used in the State. They represent equipment efficiency levels that when combined with a specific set of insulation options will result in the house not exceeding the baseline energy budget established by Section 9. The package options are in effect pre-calculated combinations which comply by the Section 9 performance calculation procedure.

A credit concept for providing incentives to encourage the use of construction features or new and emerging technologies is also implemented in the Florida Energy Code. Such technologies may include innovative air conditioners or dehumidifiers in the future. For many such technologies no consensus procedures exist for estimating the energy benefits. The credits toward compliance with the energy budgets established by Section 9 cannot be based on a rigorous one-for-one equivalent energy use for such cases. Other technologies may alleviate or enhance the peak electric power demand. Peak power generation siginificantly affects the cost of energy and the efficiency of its generation in predominantly electric states such as Florida. The flexibility to address issues related to energy use through energy efficiency building codes would be prohibited or impaired by the proposed requirement that credits could only be based on a one-for-one equivalent energy use.

TABLE 1

HVAC SYSTEM HEATING EQUIPMENT:
ELECTRIC DRIVEN HEAT PUMPS
MINIMUM COP[1]

SOURCE AND OUTDOOR TEMPERATURE (°F)	MINIMUM COP
Air Source - 47 db/43wb	2.5
Package terminal (PTAC)	2.2
Air Source - 17 db/15wb	1.5
Water Source - 70°F Entering	3.0

[1] When tested at the Standard Rating Conditions specified in Table 9-8.

TABLE 2

HVAC SYSTEM HEATING EQUIPMENT: GAS- AND OIL-FIRED
MINIMUM STEADY-STATE COMBUSTION EFFICIENCY[1,2]
(Furnaces of Capacities of 225,000 Btu/h and Less and Boilers of Capacities of 300,000 Btu/h and Less)

TYPES OF EQUIPMENT	PERCENT[3]
Forced-air furnaces, low pressure steam, and hot water boilers	74
Gravity central furnaces	69
All other vented	69

[1] Not to be confused with the Annual Fuel Utilization Efficiency (AFUE) of the equipment (see definitions in Section 2).

[2] Minimum efficiencies referenced are the same as those listed in Section 903.8 of the 1984 Florida Energy Efficiency Code pursuant to 10CFR430.32.

[3] Steady-state combustion efficiency for furnaces of capacities of 225,000 Btu/h and less and boilers of capacities of 300,000 Btu/h and less shall be tested in accordance with the applicable U.S. Department of Energy furnace test procedure (Std. RS-26).

TABLE 3

HVAC SYSTEM COOLING EQUIPMENT: ELECTRICALLY DRIVEN MINIMUM EER AND SEER[1,2,3]

STANDARD RATING CAPACITY	EER	SEER
Under 65,000 Btu/h (19 KW)		
Central Units		7.8
Room Units	7.5	
Packaged Terminal Air Conditioners & Heat Pumps under 13,000 Btu/h	7.5	
Packaged Terminal Air Conditioners & Heat Pumps over 13,000 Btu/h	7.0	
65,000 Btu/h (19 KW) and over	8.2[4]	

[1] When tested at the Standard Rating Conditions specified in Table 9-14B. Air Conditioning and Refrigeration Institute (ARI) or Association of Home Appliance Manufacturers (AHAM) ratings will be used; efficiency ratings listed under either "coil" or "blower" categories are acceptable. Test procedures for equipment referenced shall be in accordance with the applicable standard listed in Section 7.

[2] The Department of Energy has established required test procedures for single-phase air-cooled residential central air conditioners under 19kw (65,000 Btu/h) in capacity, which have been incorporated into ARI Standard 210-79.

[3] Minimum efficiencies referenced are the same as those listed in Section 903.8, Florida Energy Efficiency Code pursuant to 10CFR Section 430.32.

[4] Air cooled air conditioners over 65,000 Btu/h in capacity may have an EER of 8.0 or greater if a return air fan is included in the rating.

TABLE 4

MINIMUM WATER HEATING EFFICIENCY REQUIREMENTS

904.2(a) All tanks shall bear labels indicating compliance with ASHRAE Standard 90 or demonstrate through an independent testing laboratory that they have met the criteria below.

1. Electric Water Heaters. Automatic electric storage water heaters having a storage capacity of 120 gallons or less and an input rating of 12 kw or less shall have a standby loss not exceeding 4.0 watts/ft.^{2}/hr. of tank surface area when tested in accordance with Std. RS-5.

   Automatic electric storage water heaters having either a storage capacity greater than 120 gallons or an input rate

904.2(a) cont. greater than 12 kw shall have all water-backed storage tank surfaces insulated to at least R-10 or have a standby loss not exceeding 4.0 watts/ft.^{2}/hr. when tested in accordance with Std. RS-7.

2. Gas and oil-fired water heaters. Gas and oil fired automatic storage water heaters having an input rating of 75,000 Btu/h or less shall have a recovery efficiency (E_r) not less than 75 percent and standby loss (S) not exceeding:

$$S = 2.3 + 67/V$$

Where:
S = percent per hour of stored thermal energy;
V = rated volume in gallons;
when tested in accordance with Std. RS-5.

Gas- and oil-fired storage water heaters having an input rate over 75,000 Btu/h, but less than 4,000 Btu/h per gallon of self-stored water, shall also have a standby loss (S) not exceeding:

$$S = 2.8 + 67/V$$

Where:
S = percent per hour of stored thermal energy;
V = rated volume in gallons;
when tested in accordance with RS-7.

Other gas-fired water heaters shall have a thermal efficiency (E_t) of not less than 75 percent when tested in accordance with Std. RS-7.

Other oil-fired water heaters shall have a combustion efficiency (E_c) of not less than 80 percent. Combustion efficiency is defined as 100 - flue loss when smoke = 0 (trace is permitted).

TABLE 5
BASELINE EQUIPMENT EFFICIENCY LEVELS
SECTION 9, FLORIDA ENERGY CODE
BY CLIMATE ZONE

	North	Central	South
Cooling: Air conditioner efficiency Seasonal Energy Efficiency Ratio (SEER)	8.5	9.0	9.0
Heating, electrical: Coefficient of Performance (COP)	2.7	1.0	1.0
Water heating, electric: Energy Factor (EF)	.88	.88	.88

ENERGY REGULATION AND CONSERVATION SUBCOMMITTEE
OF THE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
WASHINGTON, D.C.

In the Matter of:

Senate Bill 2781 to Amend the)
Energy Policy and Conservation Act)
with respect to energy conservation)
standards for appliances.)

WRITTEN COMMENTS OF

LONE STAR GAS COMPANY
DIVISION OF ENSERCH CORPORATION
DALLAS, TEXAS
September 16, 1986

LONE STAR GAS COMPANY COMMENTS

Lone Star Gas Company, a division of ENSERCH Corporation, is a public utility engaged in gathering, transmitting and distributing natural gas to more than 1.2 million residential and commercial customers in 589 cities and towns of Texas and Oklahoma. Lone Star Gas Company is vitally interested in the Proposed National Appliance Energy Efficiency Act of 1986 (S. 2781). Virtually all of our customers will be affected by this Act, based on the energy consumption criteria for use of natural gas for the listed gas appliances. For this reason, Lone Star believes it has a responsibility to its customers to comment on portions of the proposed legislation.

Lone Star Gas Company has extensive experience in conservation programs and hands-on experience with applications and installations of energy-efficient appliances. We have effectively promoted and introduced high-efficiency models of gas furnaces and water heaters into our service area. Lone Star has conducted hundreds of conservation presentations and 42,904 in-home customer energy audits through participation in the Residential Conservation Service (RCS) program. Lone Star commends the excellent work of this Subcommittee on recent RCS/CACS legislation, which we believe will result in more cost effective conservation programs.

We strongly support conservation of the nation's natural resources including the concept of performance standards which prescribe a minimum level of energy efficiency and a maximum quantity of energy use for specified appliances. Our concern with this legislation is that appliances which are designed to serve the same purpose, provide heat and hot water, are treated differently based on the type of fuel they use. We believe that treating similar appliances differently will create a burden on our customers as well as place us at a marketing disadvantage. These comments address the minimum levels of energy efficiency requirements for gas-fired central furnaces and water heaters.

The proposed legislation sets significantly higher efficiency levels for gas furnaces while no efficiency levels are required of comparable electric resistance furnaces or the heating cycle of heat pumps. For example, the absence of a standard gives an advantage to the use of electric resistance furnaces for space heating despite the fact that such electric furnaces are cost inefficient. An average size electric resistance furnace (15kw) costs about $736 to operate, annually, compared to a comparable gas furnace which costs $363, annually.

Approximately 26% of our customers currently have gas furnaces with efficiency ratings below 70%. The average cost to upgrade a gas furnace to the proposed 78% would be $900, $380 above the existing cost and $300 above the average cost (local purchase and installation costs) of replacement with an electric resistance heating furnace. The Act would force a significant burden upon these customers, and particularly on fixed and low-income users, the least able to afford it.

Approximately 28% (341,000) of Lone Star's consumers have gas water heaters below the required efficiency levels. The cost to upgrade a gas water heater to the higher efficiency level would be approximately $375, $160 above current cost and $110 above the cost of the comparable electric model. Operating costs vary substantially. Based on the Consumers' Directory of Certified Water Heater Efficiency Ratings, the estimated annual operating cost for a gas water heater (40 gal) with an energy factor .54 is $194 (60 cents per therm). The annual operating cost of a comparable electric water heater (52 gal) with an energy factor of .89 (.065 cents/kw) is $393. The higher annual operating cost of $199 for the electric water heater will have a sizable economic impact on these users.

The proposed appliance efficiency standards will have a severe economic impact on the Company's fixed and low-income consumers when it is time for them to replace their existing central furnace or water heater with a more expensive model designed to meet the higher efficiency standards. As an example, when considering the replacement of an existing gas furnace, the customer will be faced with the following choices: a more expensive gas furnace designed to meet this legislation's very high efficiency requirements for gas furnaces or an electric resistance furnace, which will be the least expensive option at the time of purchase but for which there are no heating efficiency standards required in the bill. Since only the gas furnace is required to show higher efficiency standards over its lifetime and consumers are not provided with information on the electric resistance furnace, it is very likely that fixed and lower income customers will choose a lower initial purchase cost of electric heating without consideration for the lower annual operating cost of the gas heater.

The unrestricted use of these electric appliances will be counter-productive to conserving the nation's energy resources. Rather, the promotion of these electric appliances through this Act will increase the national electrical energy output, contributing to the need for construction of additional power plant facilities, directly contrary to one purpose of the Act.

We conclude that the efficiency standards imposed on gas appliances are unreasonably high relative to proposed electric appliance standards or to the proposed absence of standards for certain electric appliances. We would like an opportunity to work with the Subcommittee on modifications of these standards to better serve the heating and hot water needs of our customers.

STATEMENT OF ROBERT SAXVIK, CHAIRMAN
NORTHWEST POWER PLANNING COUNCIL
on S.2781
THE NATIONAL APPLIANCE ENERGY CONSERVATION ACT OF 1986

Before the Subcommittee on Energy Regulation and Conservation
Senate Committee on Energy and Natural Resources

September 16, 1986

Mr. Chairman and members of the committee, I am Robert Saxvik, Chairman of the Northwest Power Planning Council. The Council is pleased to join the broad coalition of appliance manufacturers, governmental, environmental, and utility groups in supporting S.2781, the National Appliance Energy Conservation Act of 1986. After years of adversarial relationships and months of hard work over the current compromise bill, we are glad to see such diverse groups as the Natural Resources Defense Council and the Association of Home Appliance Manufacturers coalescing in support of this bill. This bill is in everyone's best interest. The appliance industry won't have to face a patchwork of state requirements; consumers will pay less for owning and operating their appliances; and utilities will be able to postpone expensive thermal power plant additions and serve their customers with inexpensive power conserved by efficient appliances.

The Power Planning Council was established by the Governors of the Pacific Northwest states and the Congress pursuant to the Pacific Northwest Electric Power Planning and Conservation Act of 1980. Our Congressionally assigned duties include planning for the energy resources that will be needed to meet future electricity demand in the four Northwest states. As part of that work, the Council develops a 20-year Power Plan to guide the region toward an adequate and reliable supply of electric power at the lowest possible cost. This means planning for the acquisition of necessary resources with the least expensive ones selected first.

Conservation plays a key role in the menu of resources included in the least cost energy future described in the 1986 Power Plan. The 3700 average megawatts of conservation resources called for in the high demand forecast of the Power Plan cost an average of 2.4 cents per kilowatt-hour. This is about half the cost of electricity generated from a new coal plant. Appliance standards for refrigerators and freezers are the very cheapest of all available conservation resources, costing only 0.8 cents per kilowatt-hour. These figures clearly show that securing electricity through appliance standards is essential if future electricity costs are to be minimized.

Refrigerators, freezers and electric water heaters are the appliances covered by S.2781 that are of most concern to the Northwest. The 1986 Power Plan calls for the Northwest states to adopt refrigerator and freezer efficiency standards that are equivalent to California's 1992 standard. In the high demand forecast, these standards could be worth 220 average megawatts over the period from 1992 to 2005. The Plan also calls for adoption of an electric water heater standard equivalent to California's current standard, which could save 135 average megawatts. S. 2781 calls for water heater standards that are in agreement with the recommendations in the Power Plan and we fully support these levels.

S. 2781 does not set initial levels of efficiency for refrigerators and freezers that are as stringent as those proposed in the Plan. Our analysis of the cost-effectiveness of refrigerators and freezers indicates that levels well beyond the interim standards in the bill are highly cost-effective. We also think that it is important to secure the full amount of cost effective conservation from new refrigerators and freezers when they are manufactured, since these appliances cannot be retrofitted in future years.

The Council supports S.2781 because it provides that DOE will periodically review the level of the standards and revise the standards to economically justified, technologically feasible levels. Our staff has analyzed existing work in the area of refrigerator and freezer efficiency improvements, and we think levels comparable to those included in the Power Plan will prove cost-effective. We look forward to working with DOE to help set appropriate levels for these appliances in the future.

Finally, we have a concern with one particular section of the bill that deals with provisions for state exemptions from the efficiency ceilings in the federal standards. First, it is important that the legislative history recognize that the tough criteria for exemptions are not so restrictive as to preclude exemptions. While we recognize that tightened requirements for state waivers are an important aspect of this compromise bill, it is also important that if compelling conditions exist, qualifying states should be able to obtain an exemption.

Second, the bill requires that a state's energy plan and forecast find appliance regulation preferable to alternative energy sources in terms of costs and benefits in order for that state to obtain a exemption. Since the Council is the electrical energy planning arm of the four Northwest states and analyzes resources in exactly this manner, we would like to see the legislative history of this bill explicitly clarify that the planning and forecasting work of a regional governmental planning body could be used by states within the region to help qualify for an exemption.

We are pleased to see S.2781 under consideration. The bill presents an opportunity to secure the cost-effective and important resource that comes from improving appliance efficiencies. Passage of this bill would be good news for consumers and utilities in the four Northwest states, and for the nation as a whole.

Thank you for this opportunity to comment, and we would be happy to respond to any questions the Committee may have.